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[001]

PEPTIDE YY ANALOGS

FIELD OF THE INVENTION

[002] This invention relates to peptides which are useful as therapeutic agents in the treatment of feeding and gastroenterological conditions and disorders.

BACKGROUND OF THE INVENTION

[003] Peptide YY (PYY) is a 36-residue peptide amide isolated originally from porcine intestine, and localized in the endocrine cells of the gastrointestinal tract and pancreas (Tatemoto et al. Proc. Natl. Acad. Sci. 79:2514, 1982). PYY shares a number of central and peripheral regulatory roles with its homologous peptide Neuropeptide Y (NPY), which was originally isolated from porcine brain (Tatemoto, Proc. Natl. Acad. Sci. 79:5485, 1982). PYY is localized in intestinal cells; NPY, in contrast, is present in the submucous and myenteric neurons which innervate the mucosal and smooth muscle layers, respectively (Ekblad et al. Neuroscience 20:169, 1987). Both PYY and NPY are believed to inhibit gut motility and blood flow (Laburthe, Trends Endocrinol. Metab. 1:168, 1990), and they are also thought to attenuate basal (Cox et al. Br. J. Pharmacol. 101:247, 1990; Cox et al. J. Physiol. 398:65, 1988; Cox et al. Peptides 12:323, 1991; Friel et al. Br. J. Pharmacol. 88:425, 1986) and secretagogue-induced intestinal secretion in rats (Lundberg et al. Proc. Natl. Acad. Sci USA 79:4471, 1982; Playford et al. Lancet 335:1555, 1990) and humans (Playford et al., supra), as well as stimulate net absorption (MacFadyen et al. Neuropeptides 7:219, 1986). Elevated plasma PYY levels have been reported in individuals suffering from several conditions that cause diarrhea (Adrian et al. Gastroenterology 89:1070, 1985). Taken together, these observations suggest that PYY and NPY are released into the circulation after a meal (Adrian et al. Gastroenterology 89:1070, 1985; Balasubramaniam et al. Neuropeptides 14:209, 1989), and, thus, may play a physiological role in regulating intestinal secretion and absorption, serving as natural inhibitors of diarrhea.

[004] A high affinity PYY receptor system which exhibits a slightly higher affinity for PYY than NPY has been characterized in rat intestinal epithelia (Laburthe et al. Endocrinology 118:1910, 1986; Laburthe, Trends Endocrinol. Metab. supra) and shown to be negatively coupled to adenylate cyclase (Servin et al. Endocrinology 124:692, 1989). Consistently, PYY exhibited greater antisecretory potency than NPY in voltage clamped preparations of rat small intestine (Cox et al. J. Physiol. supra), while C-terminal fragments of NPY were found to be less effective in their antisecretory potency than PYY (Cox et al. Br. J. Pharmacol. supra). Structure-activity studies using several partial sequences have led to the identification of PYY(22-36) as the active site for interacting with intestinal PYY receptors (Balasubramaniam et al. Pept. Res. 1:32, 1988). PYY[3-36] is reportedly a selective ligand at

the Y2 and Y5 receptors, which appear pharmacologically unique in preferring N-terminally truncated (i.e. C-terminal fragments of) NPY analogs.

[005] PYY has been implicated in a number of physiological activities including nutrient uptake (see, e.g., Bilcheik et al. *Digestive Disease Week* 506:623, 1993), cell proliferation (see, e.g., Laburthe, *Trends Endocrinol. Metab.* 1:168, 1990; Voisin et al. *J. Biol. Chem.*, 1993), lipolysis (see, e.g., Valet et al., *J. Clin. Invest.* 85:291, 1990), and vasoconstriction (see, e.g., Lundberg et al., *Proc. Natl. Acad. Sci., USA* 79:4471, 1982). Recently it has been suggested that infusion of normal postprandial concentrations of PYY(3-36) significantly reduces appetite and food intake in humans (see Batterham et al., *Nature* 418:650-654, 2002; Batterham et al., *N Engl J Med.* 349:941, 2003).

[006] Peripheral administration of PYY reportedly reduces gastric acid secretion, gastric motility, exocrine pancreatic secretion (Yoshinaga, Mochizuki et al. *Am J Physiol* 263: G695-701, 1992) (Guan, Maouyo et al. *Endocrinology* 128: 911-6, 1991) (Pappas, Debas et al. *Gastroenterology* 91: 1386-9, 1986), gallbladder contraction and intestinal motility (Savage, Adrian et al. *Gut* 28: 166-70, 1987). The effects of central injection of PYY on gastric emptying, gastric motility and gastric acid secretion, as seen after direct injection in or around the hindbrain/brainstem (Chen and Rogers. *Am J Physiol* 269: R787-R792, 1995) (Chen, Rogers et al. *Regul Pept* 61: 95-98, 1996) (Yang and Tache. *Am J Physiol* 268: G943-8, 1995) (Chen, Stephens et al. *Neurogastroenterol Motil* 9: 109-116, 1997), may differ from those effects observed after peripheral injection. For example, centrally administered PYY had some effects opposite to those described herein for peripherally injected PYY[3-36] in that gastric acid secretion was stimulated, not inhibited. Gastric motility was suppressed only in conjunction with TRH stimulation, but not when administered alone, and was indeed stimulatory at higher doses through presumed interaction with PP receptors. PYY has been shown to stimulate food and water intake after central administration (Morley, Levine et al. *Brain Res* 341: 200-203, 1985) (Corp, Melville et al. *Am J Physiol* 259: R317-23, 1990).

[007] Pharmacological studies and cloning efforts have revealed a number of seven transmembrane receptors for the PP family of peptides, and these receptors have been assigned the names Y1 through Y6 (and a putative PYY-preferring receptor or Y7). Typical signaling responses of these receptors are similar to those of other G_i/G_o-coupled receptors, namely inhibition of adenylate cyclase. It is apparent that there is a clustering of amino acid sequence similarity between Y1, Y4 and Y6 receptors, while Y2 and Y5 define other families. Other binding sites have been identified by the rank order of potency of various peptides. The NPY-preferring receptor has been termed Y3, and PYY-preferring receptors have also been shown to exist (putative Y7) (See Michel, Beck-Sickinger et al. *Pharmacol Rev* 50:143-50, 1998; and Gehlert, D. R. *Proc Soc Exp Biol Med* 218: 7-22, 1998).

[008] The Y5 and Y1 receptors have been suggested as the primary mediators of the food intake response (Marsh, Hollopeter et al. *Nat Med* 4: 718-21, 1998) (Kanatani, A., Mashiko, S., Murai, N., Sugimoto, N., Ito, J., Fukuroda, T., Fukami, T., Morin, N., MacNeil, D. J., Van der Ploeg, L. H., Saga, Y., Nishimura, S., and Ihara, M. *Endocrinology* 141: 1011-6, 2000). The prevalent idea has been that endogenous NPY, via these receptors, increases feeding behavior. Some proposed therapies for obesity have been directed toward antagonism of NPY receptors, while therapies for treating anorexia have been directed toward agonists of this ligand family (see, e.g., U.S. Pat. Nos. 5,939,462; 6,013,622; and 4,891,357). In general, PYY and NPY are reported to be equipotent and equally effective in all Y1, Y5 (and Y2) receptor assays studied (Gehlert, D. R. *Proc Soc Exp Biol Med* 218: 7-22, 1998). The main characteristic of putative Y3 receptors is that they recognize NPY, while PYY is at least an order of magnitude less potent. The Y3 receptor represents the only binding site/receptor shown to have a preference for NPY.

[009] There is an additional binding site/receptor which shows preference for PYYs, termed PYY-preferring receptor. Different rank orders of binding to this receptor, or class of receptors, have been reported, suggesting that there may be more than one receptor in this family. In most cases it has been applied to describe a receptor where PYY was three to five times more potent than NPY. For purposes of this disclosure, reference to pharmacology of a PYY-preferring receptor means a receptor having any degree of preference for PYY over NPY.

[010] Obesity and its associated disorders are common and very serious public health problems in the United States and throughout the world. Upper body obesity is the strongest risk factor known for type 2 diabetes mellitus, and is a strong risk factor for cardiovascular disease. Obesity is a recognized risk factor for hypertension, atherosclerosis, congestive heart failure, stroke, gallbladder disease, osteoarthritis, sleep apnea, reproductive disorders such as polycystic ovarian syndrome, cancers of the breast, prostate, and colon, and increased incidence of complications of general anesthesia. (see, e.g., Kopelman, *Nature* 404: 635-43, 2000). It reduces life-span and carries a serious risk of co-morbidities above, as well disorders such as infections, varicose veins, acanthosis nigricans, eczema, exercise intolerance, insulin resistance, hypertension, hypercholesterolemia, cholelithiasis, orthopedic injury, and thromboembolic disease (Rissanen, Heliovaara et al. *BMJ* 301: 835-7, 1990). Obesity is also a risk factor for the group of conditions called insulin resistance syndrome, or "Syndrome X." The pathogenesis of obesity is believed to be multifactorial but the basic problem is that in obese subjects nutrient availability and energy expenditure do not come into balance until there is excess adipose tissue. Obesity is currently a poorly treatable,

chronic, essentially intractable metabolic disorder. Thus there remains a need for therapeutic drugs useful in weight reduction of obese persons.

SUMMARY OF THE INVENTION

[011] Peripheral administration of PYY and PYY agonists reduces nutrient availability and is useful in the treatment of obesity and related disorders. PYY and PYY agonist compositions and uses thereof are disclosed herein to modulate nutrient availability in a patient for treating metabolic disorders which may be benefited by a reduction in nutrient availability. These methods will be useful in the treatment of, for example, obesity, diabetes, including but not limited to type 2 or non-insulin dependent diabetes, eating disorders, insulin-resistance syndrome, and cardiovascular disease.

[012] Unless otherwise indicated the term "PYY" refers to a Peptide YY polypeptide obtained or derived from any species. Thus, the term "PYY" includes both the human full length, 36 amino acid peptide as set forth in SEQ ID NO: 1, and species variations of PYY, including e.g., murine, hamster, chicken, bovine, rat, and dog PYY. By "PYY agonist" is meant any compound which elicits one or more of the effects elicited by PYY *in vivo* or *in vitro*. For example, a PYY agonist of the invention may reduce nutrient availability, for example, by augmenting food intake, gastric emptying, pancreatic secretion, or weight loss, and bind in a PYY receptor assay, or in a competitive binding assay with labeled PYY or PYY[3-36] from certain tissues having an abundance of Y receptors, including e.g., area postrema, wherein the PYY agonist is not pancreatic polypeptide. Preferably, PYY agonists would bind in such assays with an affinity of greater than about 1 μ M, more preferably with an affinity of greater than about 10 nM, more preferably still with an affinity of greater than about 1 nM. Also preferably, analogs of the invention comprise compounds according to formula (I) that bind in such assays with an affinity of greater than about 1 μ M, more preferably with an affinity of greater than about 10 nM, more preferably still with an affinity of greater than about 1 nM.

[013] By "condition or disorder which can be alleviated by reducing caloric (or nutrient) availability" is meant any condition or disorder in a subject that is either caused by, complicated by, or aggravated by a relatively high nutrient availability, or that can be alleviated by reducing nutrient availability, for example by decreasing food intake. Such conditions or disorders include, but are not limited to, obesity, diabetes, including type-2 diabetes, eating disorders, and insulin-resistance syndromes.

[014] In one aspect, the invention provides a method of treating obesity in an obese or overweight subject by administering a therapeutically effective amount of a PYY agonist of the invention. While "obesity" is generally defined as a body mass index over 30, for

purposes of this disclosure, any subject, including those with a body mass index of less than 30, who needs or wishes to reduce body weight is included in the scope of "obese." Subjects who are insulin resistant, glucose intolerant, or have any form of diabetes mellitus (e.g., type 1, 2 or gestational diabetes) can benefit from this method.

[015] In other aspects, the invention features methods of reducing food intake, treating diabetes mellitus, and improving lipid profile (including reducing LDL cholesterol and triglyceride levels and/or changing HDL cholesterol levels) comprising administering to a subject a therapeutically effective amount of a compound according to formula (I). In a preferred embodiment, a method of the invention is used to treat a condition or disorder which can be alleviated by reducing nutrient availability in a subject in need thereof, comprising administering to said subject a therapeutically effective amount of a PYY agonist of the invention. Such conditions and disorders include, but are not limited to, hypertension, dyslipidemia, cardiovascular disease, eating disorders, insulin-resistance, obesity, and diabetes mellitus of any kind.

[016] The amino acid sequences for human and for rat PYY are as follows

human: YPIKP EAPGE DASPE ELNRY YASLR HYLNL VTRQR Y (SEQ ID NO:1)

rat: YPAKP EAPGE DASPE ELSRY YASLR HYLNL VTRQR Y (SEQ ID NO:2)

Further PYY amino acid sequences are well known, including, e.g., porcine, hamster, canine, bovine, and avian (e.g, chicken).

[017] The following patents and patent publications, the disclosure of each of which is incorporated herein by reference in its entirety, disclose certain PYY analogs and uses thereof: EP0692971, EP0732875, EP0746332, EP0802972, EP1007073, EP1015007, US2002/103123, US2002/141985, US5516653, US5545549, US5574010, US5602024, US5604203, US5912227, US5916869, US5968819, US5976814, US5989834, US5989920, US6046167, US6087154, US6242251, US6316203, US6355478, WO01/54486, WO02/47712, WO93/24515, WO94/22467, WO95/17906, WO95/21245, WO96/14854, WO96/16542, WO96/22783, WO97/46250, WO97/48406, and WO98/20885.

[018] Notwithstanding the foregoing there remains a continuing need for PYY analogs having improved PYY potency and/or selectivity and/or *in vitro* or *in vivo* characteristics.

SUMMARY OF THE INVENTION

[019] In one aspect, the present invention is directed to the peptides formula (I):

[020] $(R^2, R^3)A^3-A^4-A^5-A^6-A^7-A^8-A^9-A^{10}-A^{11}-A^{12}-A^{13}-A^{14}-A^{15}-A^{16}-A^{17}-A^{18}-A^{19}-A^{20}-A^{21}-A^{22}-A^{23}-A^{24}-A^{25}-A^{26}-A^{27}-A^{28}-A^{29}-A^{30}-A^{31}-A^{32}-A^{33}-A^{34}-A^{35}-A^{36}-R^1$

(I)

[021] wherein:

[022] A³ is Acc, Act, or Aib, or a D- or L- amino acid selected from the list of amino acids consisting of Ile, Leu, Nle, Tle, hLeu, Cha, Val, Ala, Nva, and Abu, or the N-methylated variant of Acc, Act, or Aib, or of said D- or L- amino acid, or is deleted;

[023] A⁴ is Aib, Acc, or Apc, or a D- or L- amino acid selected from the list of amino acids consisting of Lys, Arg, hArg, Orn, Dab, Dap, and HN-CH((CH₂)_n-N(R⁴R⁵))-C(O), or the N-methylated variant of Aib, Acc, or Apc, or of said D- or L- amino acid, or is deleted;

[024] A⁵ is Inc, or a D- or L- amino acid selected from the list of amino acids consisting of Pro, Thz, Dmt, Dhp, Ktp, 4Hyp, 3Hyp, Pip, Tic, and Oic, or the N-methylated variant of Inc or of said D- or L- amino acid, or is deleted;

[025] A⁶ is Acc or Aib, or a D- or L- amino acid selected from the list of amino acids consisting of Glu, Asp, Gln, Asn, Lys, Arg, Orn, Dab, Dap, and hArg, or the N-methylated variant of Acc or Aib, or of said D- or L- amino acid, or is deleted;

[026] A⁷ is Acc, Act, Aib, Apc, or Gly, or a D- or L- amino acid selected from the list of amino acids consisting of Ala, Abu, Val, and Nva, or the N-methylated variant of Acc, Act, Aib, Apc, or Gly, or of said D- or L- amino acid, or is deleted;

[027] A⁸ is Inc or a D- or L- amino acid selected from the list of amino acids consisting of Pro, Thz, Dmt, Dhp, Ktp, 4Hyp, 3Hyp, Pip, Tic, and Oic, or the N-methylated variant of Inc or of said D- or L- amino acid, or is deleted;

[028] A⁹ is Acc, Aib, or Gly, or D- or L- Ala, or the N-methylated variant of Acc, Aib, Gly, or D- or L- Ala, or is deleted;

[029] A¹⁰ is Acc or Aib, or a D- or L- amino acid selected from the list of amino acids consisting of Glu, Asp, Gln, and Asn, or the N-methylated variant of Acc or Aib, or of said D- or L- amino acid, or is deleted;

[030] A¹¹ is Acc or Aib, or a D- or L- amino acid selected from the list of amino acids consisting of Asp, Glu, Gln, and Asn, or the N-methylated variant of Acc or Aib, or of said D- or L- amino acid, or is deleted;

[031] A¹² is Acc, Act, Aib, Apc, or Gly, or a D- or L- amino acid selected from the list of amino acids consisting of Ala, Abu, Val, and Nva, or the N-methylated variant of Acc, Act, Aib, Apc, or Gly, or of said D- or L- amino acid, or is deleted;

[032] A¹³ is Acc, Aib, or Act, or a D- or L- amino acid selected from the list of amino acids consisting of Ser, Thr, Ala, Abu, and Val, or the N-methylated variant of Acc, Aib, or Act, or of said D- or L- amino acid, or is deleted;

[033] A¹⁴ is Inc or a D- or L- amino acid selected from the list of amino acids consisting of Pro, Thz, Dmt, Dhp, Ktp, 4Hyp, 3Hyp, Pip, Tic, and Oic, or the N-methylated variant of Inc or of said D- or L- amino acid, or is deleted;

[034] A¹⁵ is Acc or Aib, or a D- or L- amino acid selected from the list of amino acids consisting of Glu, Asp, Gln, and Asn, or the N-methylated variant of Acc or Aib, or of said D- or L- amino acid, or is deleted;

[035] A¹⁶ is Acc or Aib, or a D- or L- amino acid selected from the list of amino acids consisting of Glu, Asp, Gln, and Asn, or the N-methylated variant of Acc or Aib, or of said D- or L- amino acid, or is deleted;

[036] A¹⁷ is Acc or Aib, or a D- or L- amino acid selected from the list of amino acids consisting of Leu, Ile, Nle, Tle, hLeu, Cha, Val, Ala, Nva, Abu, and Phe, or the N-methylated variant of Acc or Aib, or of said D- or L- amino acid, or is deleted;

[037] A¹⁸ is Acc or Aib, or a D- or L- amino acid selected from the list of amino acids consisting of Asn, Gln, Glu, and Asp, or the N-methylated variant of Acc or Aib, or of said D- or L- amino acid, or is deleted;

[038] A¹⁹ is Acc, Aib, or Apc, or a D- or L- amino acid selected from the list of amino acids consisting of Arg, hArg, Lys, Orn, Dab, Dap, and $\text{HN-CH}((\text{CH}_2)_n\text{-N(R}^4\text{R}^5))\text{-C(O)}$, or the N-methylated variant of Acc, Aib, or Apc, or of said D- or L- amino acid, or is deleted;

[039] A²⁰ is Acc or Aic, or a D- or L- amino acid selected from the list of amino acids consisting of Tyr, Phe, hPhe, 2Thi, 3Thi, Taz, 2Fua, Trp, 2Nal, 1Nal, Cha, 2Pal, 3Pal, 4Pal, and (X¹,X²,X³,X⁴,X⁵)Phe, or the N-methylated variant of Acc or Aic, or of said D- or L- amino acid, or is deleted;

[040] A²¹ is Acc or Aic, or a D- or L- amino acid selected from the list of amino acids consisting of Tyr, Phe, hPhe, 2Thi, 3Thi, Taz, 2Fua, Trp, 2Nal, 1Nal, Cha, 2Pal, 3Pal, 4Pal, and (X¹,X²,X³,X⁴,X⁵)Phe, or the N-methylated variant of Acc or Aic, or of said D- or L- amino acid, or is deleted;

[041] A²² is Acc, Act, Aib, Apc, or Gly, or a D- or L- amino acid selected from the list of amino acids consisting of Ala, Aib, Abu, Val, and Nva, or the N-methylated variant of Acc, Act, Aib, Apc, or Gly, or of said D- or L- amino acid, or is deleted;

[042] A²³ is Acc, Act, or Aib, or a D- or L- amino acid selected from the list of amino acids consisting of Ser, Thr, Ala, Abu, and Val, or the N-methylated variant of Acc, Act, or Aib, or of said D- or L- amino acid, or is deleted;

[043] A²⁴ is Acc or Aib, or a D- or L- amino acid selected from the list of amino acids consisting of Leu, Ile, Nle, Tle, hLeu, Cha, Val, Ala, Nva, Abu, Trp, and Phe, or the N-methylated variant of Acc or Aib, or of said D- or L- amino acid, or is deleted;

[044] A²⁵ is Acc, Aib, or Aib, or a D- or L- amino acid selected from the list of amino acids consisting of Arg, hArg, Lys, Orn, Dab, Dap, Aib, and HN-CH((CH₂)_n-N(R⁴R⁵))-C(O), or the N-methylated variant of Acc, Aib, or Aib, or of said D- or L- amino acid, or is deleted;

[045] A²⁶ is Acc, Aib, or Apc, or a D- or L- amino acid selected from the list of amino acids consisting of His, 2Pal, 3Pal, 4Pal, Taz, 2Thi, 3Thi, 2Fua, HN-CH((CH₂)_n-N(R⁴R⁵))-C(O), and (X¹,X²,X³,X⁴,X⁵)-Phe, or the N-methylated variant of Acc, Aib, or Apc, or of said D- or L- amino acid, or is deleted;

[046] A²⁷ is Acc or Aic, or a D- or L- amino acid selected from the list of amino acids consisting of Tyr, Phe, hPhe, 2Thi, 3Thi, Taz, 2Fua, Trp, 2Nal, 1Nal, Cha, 2Pal, 3Pal, 4Pal, and (X¹,X²,X³,X⁴,X⁵)-Phe, or the N-methylated variant of Acc or Aic or of said D- or L- amino acid;

[047] A²⁸ is Acc or Aib, a D- or L- amino acid selected from the list of amino acids consisting of Leu, Ile, Nle, Tle, hLeu, Trp, Cha, Val, Ala, Nva, Abu, and Phe, or the N-methylated variant of Acc or Aib, or of said D- or L- amino acid;

[048] A²⁹ is Acc or Aib, or a D- or L- amino acid selected from the list of amino acids consisting of Asn, Gln, Glu, Asp, and Trp, or the N-methylated variant of Acc or Aib, or of said D- or L- amino acid;

[049] A³⁰ is Acc or Aib, or a D- or L- amino acid selected from the list of amino acids consisting of Leu, Ile, Nle, Tle, hLeu, Trp, Cha, Val, Ala, Nva, Abu, and Phe or the N-methylated variant of Acc or Aib, or of said D- or L- amino acid;

[050] A³¹ is Acc or Aib, or a D- or L- amino acid selected from the list of amino acids consisting of Val, Leu, Ile, Nle, Tle, hLeu, Cha, Ala, Nva, Abu, Trp, and Phe, or the N-methylated variant of Acc or Aib, or of said D- or L- amino acid;

[051] A³² is Acc, Act, or Aib, or a D- or L- amino acid selected from the list of amino acids consisting of Thr, Ser, Ala, Abu, Trp, DTrp, and Val, or the N-methylated variant of Acc, Act, or Aib, or of said D- or L- amino acid;

[052] A^{33} is Acc, Aib, or Apc, or a D- or L- amino acid selected from the list of amino acids consisting of Arg, hArg, Lys, Orn, Dab, Dap, and $\text{HN-CH}((\text{CH}_2)_n\text{-N}(\text{R}^4\text{R}^5))\text{-C(O)}$, or the N-methylated variant of Acc, Aib, or Apc, or of said D- or L- amino acid;

[053] A^{34} is Acc, Aib, or Apc, or a D- or L- amino acid selected from the list of amino acids consisting of Gln, Asn, Glu, Asp, or the N-methylated variant of Acc, Aib, or Apc, or of said D- or L- amino acid;

[054] A^{35} is Acc, Aib, or Apc, or a D- or L- amino acid selected from the list of amino acids consisting of Arg, hArg, Lys, Orn, Dab, Dap, and $\text{HN-CH}((\text{CH}_2)_n\text{-N}(\text{R}^4\text{R}^5))\text{-C(O)}$, or the N-methylated variant of Acc, Aib, or Apc, or of said D- or L- amino acid;

[055] A^{36} is Acc, Aic or Apc, or a D- or L- amino acid selected from the list of amino acids consisting of Tyr, Phe, hPhe, 2Thi, 3Thi, Taz, 2Fua, Trp, 2NaI, 1NaI, Cha, 2Pal, 3Pal, 4Pal, and $(\text{X}^1, \text{X}^2, \text{X}^3, \text{X}^4, \text{X}^5)\text{Phe}$, or the N-methylated variant of Acc, Aic, or Apc, or of said D- or L- amino acid;

[056] R^1 is OH or NH_2 , $(\text{C}_1\text{-C}_{30})\text{alkoxy}$, or $\text{NH-X}^6\text{-CH}_2\text{-Z}^0$, wherein X^6 is a $(\text{C}_1\text{-C}_{12})\text{hydrocarbon moiety}$, and Z^0 is -H, -OH, $\text{-CO}_2\text{H}$ or -C(O)NH_2 ;

[057] R^2 and R^3 each is, independently for each occurrence, selected from the group consisting of -H, $(\text{C}_1\text{-C}_{30})\text{alkyl}$, $(\text{C}_1\text{-C}_{30})\text{heteroalkyl}$, $(\text{C}_1\text{-C}_{30})\text{acyl}$, $(\text{C}_2\text{-C}_{30})\text{alkenyl}$, $(\text{C}_2\text{-C}_{30})\text{alkynyl}$, $\text{aryl}(\text{C}_1\text{-C}_{30})\text{alkyl}$, $\text{aryl}(\text{C}_1\text{-C}_{30})\text{acyl}$, substituted $(\text{C}_1\text{-C}_{30})\text{alkyl}$, substituted $(\text{C}_1\text{-C}_{30})\text{heteroalkyl}$, substituted $(\text{C}_2\text{-C}_{30})\text{acyl}$, substituted $(\text{C}_2\text{-C}_{30})\text{alkenyl}$, substituted $(\text{C}_2\text{-C}_{30})\text{alkynyl}$, substituted $\text{aryl}(\text{C}_1\text{-C}_{30})\text{alkyl}$, and substituted $\text{aryl}(\text{C}_1\text{-C}_{30})\text{acyl}$,

[058] provided that when R^2 is $(\text{C}_1\text{-C}_{30})\text{acyl}$, $\text{aryl}(\text{C}_1\text{-C}_{30})\text{acyl}$, substituted $(\text{C}_2\text{-C}_{30})\text{acyl}$, or substituted $\text{aryl}(\text{C}_1\text{-C}_{30})\text{acyl}$, then R^3 is -H, $(\text{C}_1\text{-C}_{30})\text{alkyl}$, $(\text{C}_1\text{-C}_{30})\text{heteroalkyl}$, $(\text{C}_2\text{-C}_{30})\text{alkenyl}$, $(\text{C}_2\text{-C}_{30})\text{alkynyl}$, $\text{aryl}(\text{C}_1\text{-C}_{30})\text{alkyl}$, substituted $(\text{C}_1\text{-C}_{30})\text{alkyl}$, substituted $(\text{C}_1\text{-C}_{30})\text{heteroalkyl}$, substituted $(\text{C}_2\text{-C}_{30})\text{alkenyl}$, substituted $(\text{C}_2\text{-C}_{30})\text{alkynyl}$, or substituted $\text{aryl}(\text{C}_1\text{-C}_{30})\text{alkyl}$;

[059] R^4 and R^5 each is, independently for each occurrence, selected from the group consisting of -H, $(\text{C}_1\text{-C}_{40})\text{alkyl}$, $(\text{C}_2\text{-C}_{40})\text{acyl}$, $(\text{C}_1\text{-C}_{30})\text{alkylsulfonyl}$, and -C(NH)NH_2 , provided that when R^4 is $(\text{C}_1\text{-C}_{40})\text{acyl}$, $(\text{C}_1\text{-C}_{30})\text{alkylsulfonyl}$, or -C(NH)NH_2 , then R^5 is -H or $(\text{C}_1\text{-C}_{40})\text{alkyl}$;

[060] n is, independently for each occurrence, 1, 2, 3, 4 or 5; and

[061] X^1 , X^2 , X^3 , X^4 , and X^5 each is, independently for each occurrence, selected from the group consisting of -H, -F, -Cl, -Br, -I, $(\text{C}_1\text{-C}_{10})\text{alkyl}$, substituted $(\text{C}_1\text{-C}_{10})\text{alkyl}$, aryl, substituted aryl, -OH, -NH_2 , -NO_2 , and -CN;

[062] provided that:

[063] (a) said peptide comprises at least one amino acid selected from the group consisting of:

[064] (i) Acc at A³, A⁶, A⁷, A⁹, A¹⁰, A¹¹, A¹², A¹⁵, A¹⁶, A¹⁷, A¹⁸, A²⁰, A²¹, A²², A²⁴, A²⁷, A²⁸, A²⁹, A³⁰, A³¹, A³², or A³⁴;

[065] (ii) Act at A³, A⁷, A¹², A¹³, A²², A²³, or A³²;

[066] (iii) Apc at A⁴, A⁷, A¹², A¹⁹, A²², A²⁵, A²⁶, A³³, A³⁵, or A³⁶;

[067] (iv) Aib at A⁶, A⁷, A⁹, A¹⁰, A¹¹, A¹², A¹³, A¹⁵, A¹⁶, A¹⁸, A²², A²⁹, or A³²;

[068] (v) Thz, Dmt, Dhp, Ktp, or Tic at A⁵, A⁸, or A¹⁴;

[069] (vi) (3,4,5-F)Phe or (2,3,4,5,6-F)Phe at A²⁰, A²¹, A²⁶, A²⁷, or A³⁶;

[070] (vii) 2Fua at A²⁰, A²¹, A²⁶, or A²⁷;

[071] (viii) Taz at A²⁰, A²¹, or A²⁶; and

[072] (ix) 2Pal, 3Pal, 4Pal, 2Thi or 3Thi at A²⁶;

[073] (b) if A³ - A²¹ are deleted and (i) A²² is Aib or (ii) A³⁶ is (3,4,5-F)Phe or (2,3,4,5,6-F)Phe, then A²⁷ is not 2Thi, Trp, 2Nal, or (X¹,X²,X³,X⁴,X⁵)Phe, wherein X¹ is *p*-chloro and X², X³, X⁴ and X⁵ each is -H; and

[074] (c) each amino acid A^m of formula (I) may be deleted only if A^{m-1} is deleted, wherein m is an integer ranging in value from 4 - 26, inclusive;

[075] or a pharmaceutically acceptable salt thereof.

[076] In a preferred embodiment the present invention is concerned with compounds according to formula (I) as defined in paragraphs [021] - [075], wherein:

[077] A³ is Acc or Aib, or a D- or L- amino acid selected from the list of amino acids consisting of Ile, Leu, Nle, Tle, hLeu, Cha, Val, Ala, Nva, and Abu, or is deleted;

[078] A⁴ is Acc, Aib, or Apc, or a D- or L- amino acid selected from the list of amino acids consisting of Lys, Arg, hArg, Orn, Dab, Dap, and HN-CH((CH₂)_n-N(R⁴R⁵))-C(O), or is deleted;

[079] A⁵ is Inc or a D- or L- amino acid selected from the list of amino acids consisting of Pro, Thz, Dmt, Dhp, Ktp, 4Hyp, 3Hyp, Pip, Tic, and Oic, or is deleted;

[080] A⁶ is Acc or a D- or L- amino acid selected from the list of amino acids consisting of Glu, Asp, Gln, Asn, Lys, Arg, Orn, Dab, Dap, and hArg, or is deleted;

[081] A⁷ is Acc, Act, Aib, Apc, or Gly, or a D- or L- amino acid selected from the list of amino acids consisting of Ala, Abu, Val, and Nva, or is deleted;

- [082] A⁸ is Inc or a D- or L- amino acid selected from the list of amino acids consisting of Pro, Thz, Dmt, Dhp, Ktp, 4Hyp, 3Hyp, Pip, Tic, and Oic, or is deleted;
- [083] A⁹ is Acc, Aib, or Gly or D- or L- Ala, or is deleted;
- [084] A¹⁰ is Acc or a D- or L- amino acid selected from the list of amino acids consisting of Glu, Asp, Gln, and Asn, or is deleted;
- [085] A¹¹ is Acc or a D- or L- amino acid selected from the list of amino acids consisting of Asp, Glu, Gln, and Asn, or is deleted;
- [086] A¹² is Acc, Act, Aib, or Apc, or a D- or L- amino acid selected from the list of amino acids consisting of Ala, Gly, Abu, Val, and Nva, or is deleted;
- [087] A¹³ is Acc, Act, or Aib, or a D- or L- amino acid selected from the list of amino acids consisting of Ser, Thr, Ala, Abu, and Val, or is deleted;
- [088] A¹⁴ is Inc or a D- or L- amino acid selected from the list of amino acids consisting of Pro, Thz, Dmt, Dhp, Ktp, 4Hyp, 3Hyp, Pip, Tic, and Oic, or is deleted;
- [089] A¹⁵ is Acc or a D- or L- amino acid selected from the list of amino acids consisting of Glu, Asp, Gln, and Asn, or is deleted;
- [090] A¹⁶ is Acc or a D- or L- amino acid selected from the list of amino acids consisting of Glu, Asp, Gln, and Asn, or is deleted;
- [091] A¹⁷ is Acc or Aib, or a D- or L- amino acid selected from the list of amino acids consisting of Leu, Ile, Nle, Tie, hLeu, Cha, Val, Ala, Nva, Abu, and Phe, or is deleted;
- [092] A¹⁸ is Aib or Acc, or a D- or L- amino acid selected from the list of amino acids consisting of Asn, Gln, Glu, and Asp, or is deleted;
- [093] A¹⁹ is Acc, Aib, or Apc, or a D- or L- amino acid selected from the list of amino acids consisting of Arg, hArg, Lys, Orn, Dab, Dap, and HN-CH((CH₂)_n-N(R⁴R⁵))-C(O), or is deleted;
- [094] A²⁰ is Acc or Aic, a D- or L- amino acid selected from the list of amino acids consisting of Tyr, Phe, hPhe, 2Thi, 3Thi, Taz, 2Fua, Trp, 2Nal, 1Nal, Cha, 2Pal, 3Pal, 4Pal, and (X¹,X²,X³,X⁴,X⁵)Phe, or is deleted;
- [095] A²¹ is Acc or Aic, or a D- or L- amino acid selected from the list of amino acids consisting of Tyr, Phe, hPhe, 2Thi, 3Thi, Taz, 2Fua, Trp, 2Nal, 1Nal, Cha, 2Pal, 3Pal, 4Pal, and (X¹,X²,X³,X⁴,X⁵)Phe, or is deleted;
- [096] A²² is Acc, Act, Aib, Apc, or Gly, or a D- or L- amino acid selected from the list of amino acids consisting of Ala, Abu, Val, and Nva, or is deleted;

[097] A²³ is Acc, Act, or Aib, or a D- or L- amino acid selected from the list of amino acids consisting of Ser, Thr, Ala, Abu, and Val, or is deleted;

[098] A²⁴ is Acc or Aib, or a D- or L- amino acid selected from the list of amino acids consisting of Leu, Ile, Nle, Tle, hLeu, Cha, Val, Ala, Nva, Abu, Trp, and Phe, or is deleted;

[099] A²⁵ is Acc, Aib, or Apc, or a D- or L- amino acid selected from the list of amino acids consisting of Arg, hArg, Lys, Orn, Dab, Dap, and HN-CH((CH₂)_n-N(R⁴R⁵))-C(O), or is deleted

[0100] A²⁶ is Acc, Aib, or Apc, or a D- or L- amino acid selected from the list of amino acids consisting of His, 2Pal, 3Pal, 4Pal, Taz, 2Thi, 3Thi, 2Fua, HN-CH((CH₂)_n-N(R⁴R⁵))-C(O), and (X¹,X²,X³,X⁴,X⁵-)Phe, or is deleted;

[0101] A²⁷ is Acc or Aic, or a D- or L- amino acid selected from the list of amino acids consisting of Tyr, Phe, hPhe, 2Thi, 3Thi, Taz, 2Fua, Trp, 2Nal, 1Nal, Cha, 2Pal, 3Pal, 4Pal, and (X¹,X²,X³,X⁴,X⁵)Phe;

[0102] A²⁸ is Acc or Aib, or a D- or L- amino acid selected from the list of amino acids consisting of Leu, Ile, Nle, Tle, hLeu, Trp, Cha, Val, Ala, Nva, Abu, and Phe;

[0103] A²⁹ is Acc or Aib, or a D- or L- amino acid selected from the list of amino acids consisting of Asn, Gln, Glu, Asp, and Trp;

[0104] A³⁰ is Acc or Aib, or a D- or L- amino acid selected from the list of amino acids consisting of Leu, Ile, Nle, Tle, hLeu, Trp, Cha, Val, Ala, Nva, Abu, and Phe;

[0105] A³¹ is Acc or Aib, or a D- or L- amino acid selected from the list of amino acids consisting of Val, Leu, Ile, Nle, Tle, hLeu, Cha, Ala, Nva, Abu, Trp, and Phe;

[0106] A³² is Acc, Act, or Aib, or a D- or L- amino acid selected from the list of amino acids consisting of Thr, Ser, Ala, Abu, Trp, and Val;

[0107] A³³ is Acc, Aib, or Apc, or a D- or L- amino acid selected from the list of amino acids consisting of Arg, hArg, Lys, Orn, Dab, Dap, and HN-CH((CH₂)_n-N(R⁴R⁵))-C(O);

[0108] A³⁴ is Acc, Aib, Apc, or Glu, or a D- or L- amino acid selected from the list of amino acids consisting of Gln, Asn, and Asp;

[0109] A³⁵ is Acc, Aib, or Apc, or a D- or L- amino acid selected from the list of amino acids consisting of Arg, hArg, Lys, Orn, Dab, Dap, and HN-CH((CH₂)_n-N(R⁴R⁵))-C(O); and

[0110] A³⁶ is Acc, Aic, or Apc, or a D- or L- amino acid selected from the list of amino acids consisting of Tyr, Phe, hPhe, 2Thi, 3Thi, Taz, 2Fua, Trp, 2Nal, 1Nal, Cha, 2Pal, 3Pal, 4Pal, and (X¹,X²,X³,X⁴,X⁵)Phe;

[0111] or a pharmaceutically acceptable salt thereof.

[0112] In a more preferred embodiment the present invention is concerned with compounds according formula (I) as defined in paragraphs [021] - [075], wherein:

[0113] A³ is Ile, Leu, Nle, Tle, hLeu, Cha, Val, Ala, Nva, Abu, Acc, or Aib, or is deleted;

[0114] A⁴ is Lys, Arg, hArg, Orn, Dab, Dap, Apc, Aib, Acc, or HN-CH((CH₂)_n-N(R⁴R⁵))-C(O), or is deleted;

[0115] A⁵ is Pro, Thz, Dmt, Dhp, Ktp, 4Hyp, 3Hyp, Pip, Tic, Oic, or Inc, or is deleted;

[0116] A⁶ is Glu, Asp, Gln, Asn, Lys, Arg, Orn, Dab, Dap, hArg, or Acc, or is deleted;

[0117] A⁷ is Ala, Aib, Gly, Abu, Val, Nva, Apc, Act, or Acc, or is deleted;

[0118] A⁸ is Pro, Thz, Dmt, Dhp, Ktp, 4Hyp, 3Hyp, Pip, Tic, Oic, or Inc, or is deleted;

[0119] A⁹ is Gly, Ala, Aib, or Acc, or is deleted;

[0120] A¹⁰ is Glu, Asp, Gln, Asn, or Acc, or is deleted;

[0121] A¹¹ is Asp, Glu, Gln, Asn, or Acc, or is deleted;

[0122] A¹² is Ala, Aib, Gly, Abu, Val, Nva, Apc, Act, or Acc, or is deleted;

[0123] A¹³ is Ser, Thr, Aib, Act, Ala, Acc, Abu, or Val, or is deleted;

[0124] A¹⁴ is Pro, Thz, Dmt, Dhp, Ktp, 4Hyp, 3Hyp, Pip, Tic, Oic, or Inc, or is deleted;

[0125] A¹⁵ is Glu, Asp, Gln, Asn, or Acc, or is deleted;

[0126] A¹⁶ is Glu, Asp, Gln, Asn, or Acc, or is deleted;

[0127] A¹⁷ is Leu, Ile, Nle, Tle, hLeu, Cha, Val, Ala, Nva, Abu, Acc, Aib, or Phe, or is deleted;

[0128] A¹⁸ is Asn, Gln, Glu, Asp, Aib, or Acc, or is deleted;

[0129] A¹⁹ is Arg, hArg, Lys, Orn, Dab, Dap, Apc, Aib, Acc, or HN-CH((CH₂)_n-N(R⁴R⁵))-C(O), or is deleted;

[0130] A²⁰ is Tyr, Phe, hPhe, 2Thi, 3Thi, Taz, 2Fua, Trp, 2Nal, 1Nal, Cha, 2Pal, 3Pal, 4Pal, (X¹,X²,X³,X⁴,X⁵)Phe, Acc, or Aic, or is deleted;

[0131] A²¹ is Tyr, Phe, hPhe, 2Thi, 3Thi, Taz, 2Fua, Trp, 2Nal, 1Nal, Cha, 2Pal, 3Pal, 4Pal, (X¹,X²,X³,X⁴,X⁵)Phe, Acc, or Aic, or is deleted;

[0132] A²² is Ala, Aib, Gly, Abu, Val, Nva, Apc, Act, Acc, or N-Me-Ala, or is deleted;

[0133] A²³ is Ser, Thr, Aib, Act, Ala, Acc, Abu, Val, or DTrp, or is deleted;

[0134] A²⁴ is Leu, Ile, Nle, Tle, hLeu, Cha, Val, Ala, Nva, Abu, Acc, Aib, Trp, or Phe, or is deleted;

[0135] A²⁵ is Arg, hArg, Lys, Orn, Dab, Dap, Apc, Aib, HN-CH((CH₂)_n-N(R⁴R⁵))-C(O), or Acc, or is deleted;

[0136] A²⁶ is His, 2Pal, D2Pal, 3Pal, 4Pal, Taz, 2Thi, 3Thi, 2Fua, Apc, Aib, Acc, HN-CH((CH₂)_n-N(R⁴R⁵))-C(O), or (X¹,X²,X³,X⁴,X⁵)-Phe, or is deleted;

[0137] A²⁷ is Tyr, Phe, hPhe, 2Thi, 3Thi, Taz, 2Fua, Trp, 2Nal, 1Nal, Cha, 2Pal, 3Pal, 4Pal, (X¹,X²,X³,X⁴,X⁵)-Phe, Acc, or Aic;

[0138] A²⁸ is Leu, Ile, Nle, Tle, hLeu, Trp, Cha, Val, Ala, Nva, Abu, Acc, Aib, or Phe;

[0139] A²⁹ is Asn, Gln, Glu, Asp, Acc, Trp, or Aib;

[0140] A³⁰ is Leu, Ile, Nle, Tle, hLeu, Trp, Cha, Val, Ala, Nva, Abu, Acc, Aib, or Phe;

[0141] A³¹ is Val, Leu, Ile, Nle, Tle, hLeu, Cha, Ala, Nva, Abu, Acc, Aib, Trp, or Phe;

[0142] A³² is Thr, Ser, Aib, Act, Ala, Acc, Abu, Trp, DTrp, or Val;

[0143] A³³ is Arg, hArg, Lys, Orn, Dab, Dap, Apc, Aib, HN-CH((CH₂)_n-N(R⁴R⁵))-C(O), or Acc;

[0144] A³⁴ is Gln, Asn, Glu, Asp, Acc, Aib, or Apc;

[0145] A³⁵ is Arg, hArg, Lys, Orn, Dab, Dap, Apc, Aib, HN-CH((CH₂)_n-N(R⁴R⁵))-C(O), or Acc; and

[0146] A³⁶ is Tyr, Phe, hPhe, 2Thi, 3Thi, Taz, 2Fua, Trp, 2Nal, 1Nal, Cha, 2Pal, 3Pal, 4Pal, (X¹,X²,X³,X⁴,X⁵)-Phe, Acc, Aic, or Apc;

[0147] or a pharmaceutically acceptable salt thereof.

[0148] In a still more preferred embodiment the present invention is concerned with compounds according formula (I) as defined in paragraphs [021] - [075], wherein:

[0149] A³ is Ile, Leu, Nle, Val, Acc, or Aib, or is deleted;

[0150] A⁴ is Lys, Arg, hArg, Orn, or Apc, or is deleted;

[0151] A⁵ is Pro, Thz, Dmt, 4Hyp, or 3Hyp, or is deleted;

[0152] A⁶ is Glu, Asp, Gln, or Acc, or is deleted;

[0153] A⁷ is Ala, Aib, Abu, Act, or Acc, or is deleted;

[0154] A⁸ is Pro, Thz, Dmt, 4Hyp, or 3Hyp, or is deleted;

[0155] A⁹ is Gly, Aib, or Acc, or is deleted;

- [0156] A¹⁰ is Glu, Asp, Gln, or Acc or is deleted;
- [0157] A¹¹ is Asp, Glu, Asn, or Acc or is deleted;
- [0158] A¹² is Ala, Aib, Act, or Acc, or is deleted;
- [0159] A¹³ is Ser, Thr, Aib, Act, or Acc, or is deleted;
- [0160] A¹⁴ is Pro, Thr, Dmt, 4Hyp, or 3Hyp, or is deleted;
- [0161] A¹⁵ is Glu, Asp, Gln, or Acc, or is deleted;
- [0162] A¹⁶ is Glu, Asp, Gln, or Acc or is deleted;
- [0163] A¹⁷ is Leu, Ile, Nle, Val, Acc, or Aib, or is deleted;
- [0164] A¹⁸ is Asn, Gln, Asp, Aib, or Acc or is deleted;
- [0165] A¹⁹ is Arg, hArg, Lys, or Apc, or is deleted;
- [0166] A²⁰ is Tyr, Phe, 2Pal, 3Pal, 4Pal, (X¹,X²,X³,X⁴,X⁵)Phe, or Acc, or is deleted;
- [0167] A²¹ is Tyr, Phe, 2Pal, 3Pal, 4Pal, (X¹,X²,X³,X⁴,X⁵)Phe, or Acc, or is deleted;
- [0168] A²² is Ala, Aib, Abu, or Acc, or is deleted;
- [0169] A²³ is Ser, Thr, Aib, Act, or Ala, or is deleted;
- [0170] A²⁴ is Leu, Ile, Nle, Val, Acc, or Aib, or is deleted;
- [0171] A²⁵ is Arg, hArg, Lys, or Apc, or is deleted;
- [0172] A²⁶ is His, 2Pal, D2Pal, 3Pal, 4Pal, Taz, 2Thi, 3Thi, Apc, or (X¹,X²,X³,X⁴,X⁵-)Phe, or is deleted;
- [0173] A²⁷ is Tyr, Phe, 2Pal, 3Pal, 4Pal, (X¹,X²,X³,X⁴,X⁵)Phe or Acc;
- [0174] A²⁸ is Leu, Ile, Nle, Val, Acc or Aib;
- [0175] A²⁹ is Asn, Gln, Asp, Acc or Aib;
- [0176] A³⁰ is Leu, Ile, Nle, Val, Acc or Aib;
- [0177] A³¹ is Val, Leu, Ile, Ala, Acc or Aib;
- [0178] A³² is Thr, Ser, Aib, Act or Acc;
- [0179] A³³ is Arg, hArg, Lys or Apc;
- [0180] A³⁴ is Gln, Asn, Glu, Aib or Apc;
- [0181] A³⁵ is Arg, hArg, Lys or Apc; and
- [0182] A³⁶ is Tyr, Phe, 2Pal, 3Pal, 4Pal, (X¹,X²,X³,X⁴,X⁵)Phe or Apc;

[0183] or a pharmaceutically acceptable salt thereof.

[0184] In yet a still more preferred embodiment the present invention is concerned with compounds according formula (I) as defined in paragraphs [021] - [075], wherein:

[0185] A³ is Ile or Acc, or is deleted;

[0186] A⁴ is Lys or Apc, or is deleted;

[0187] A⁵ is Pro or is deleted;

[0188] A⁶ is Glu or Acc, or is deleted;

[0189] A⁷ is Ala, Act, or Acc, or is deleted;

[0190] A⁸ is Pro or is deleted;

[0191] A⁹ is Gly or Acc, or is deleted;

[0192] A¹⁰ is Glu or Acc, or is deleted;

[0193] A¹¹ is Asp or Acc, or is deleted;

[0194] A¹² is Ala, Act, or Acc, or is deleted;

[0195] A¹³ is Ser, Act, or Acc, or is deleted;

[0196] A¹⁴ is Pro or is deleted;

[0197] A¹⁵ is Glu or Acc, or is deleted;

[0198] A¹⁶ is Glu or Acc, or is deleted;

[0199] A¹⁷ is Leu or Acc, or is deleted;

[0200] A¹⁸ is Asn or Acc, or is deleted;

[0201] A¹⁹ is Arg or Apc, or is deleted;

[0202] A²⁰ is Tyr, (X¹,X²,X³,X⁴,X⁵)Phe, or Acc, or is deleted;

[0203] A²¹ is Tyr, (X¹,X²,X³,X⁴,X⁵)Phe, or Acc, or is deleted;

[0204] A²² is Ala, Aib, or Acc, or is deleted;

[0205] A²³ is Ser or Act, or is deleted;

[0206] A²⁴ is Leu or Acc, or is deleted;

[0207] A²⁵ is Arg or Apc, or is deleted;

[0208] A²⁶ is His, 2Pal, D2Pal, 3Pal, 4Pal, Taz, Apc, or (X¹,X²,X³,X⁴,X⁵-)Phe, or is deleted;

[0209] A²⁷ is Tyr, (X¹,X²,X³,X⁴,X⁵)Phe, or Acc;

- [0210] A²⁸ is Leu, or Acc;
- [0211] A²⁹ is Asn or Acc;
- [0212] A³⁰ is Leu or Acc;
- [0213] A³¹ is Val, Leu or Acc;
- [0214] A³² is Thr, Act, or Acc;
- [0215] A³³ is Arg or Apc;
- [0216] A³⁴ is Gln or Apc;
- [0217] A³⁵ is Arg or Apc; and
- [0218] A³⁶ is Tyr, (X¹,X²,X³,X⁴,X⁵)Phe, or Apc;
- [0219] or a pharmaceutically acceptable salt thereof.
- [0220] In yet a still more preferred embodiment the present invention is concerned with compounds according formula (I) as defined in paragraphs [021] - [075], wherein:
- [0221] Acc is, independently for each occurrence, A5c or A6c; and
- [0222] (X¹,X²,X³,X⁴,X⁵)Phe is, independently for each occurrence, (3,4,5-F)Phe or (2,3,4,5,6-F)Phe;
- [0223] or a pharmaceutically acceptable salt thereof.
- [0224] In yet a still more preferred embodiment the present invention is concerned with compounds according formula (I) as defined in paragraphs [021] - [075], wherein:
- [0225] A³ is Ile or is deleted;
- [0226] A⁴ is Lys or is deleted;
- [0227] A⁶ is Glu or is deleted;
- [0228] A⁷ is Ala or is deleted;
- [0229] A⁹ is Gly or is deleted;
- [0230] A¹⁰ is Glu or is deleted;
- [0231] A¹¹ is Asp or is deleted;
- [0232] A¹² is Ala or is deleted;
- [0233] A¹³ is Ser or is deleted;
- [0234] A¹⁴ is Pro or is deleted;
- [0235] A¹⁵ is Glu or is deleted;

- [0236] A¹⁶ is Glu or is deleted;
[0237] A¹⁷ is Leu or is deleted;
[0238] A¹⁸ is Asn or is deleted;
[0239] A¹⁹ is Arg or is deleted;
[0240] A²⁰ is Tyr or is deleted;
[0241] A²¹ is Tyr or is deleted;
[0242] A²² is Ala, Aib, or A5c, or is deleted;
[0243] A²³ is Ser or is deleted;
[0244] A²⁴ is Leu or A6c;
[0245] A²⁵ is Arg;
[0246] A²⁶ is His, 2Pal, D2Pal, 3Pal, 4Pal, or Taz;
[0247] A²⁷ is Tyr or (3,4,5-F)Phe;
[0248] A²⁸ is Leu, or A6c;
[0249] A²⁹ is Asn;
[0250] A³⁰ is Leu or A6c;
[0251] A³¹ is Val, Leu, A5c or A6c;
[0252] A³² is Thr;
[0253] A³³ is Arg;
[0254] A³⁴ is Gln; and
[0255] A³⁶ is Tyr;
[0256] or a pharmaceutically acceptable salt thereof.

[0257] In yet a still more preferred embodiment the present invention is concerned with a compound according formula (I) as defined in paragraphs [021] - [075], wherein said compound is:

- [0258] ((2,3,4,5,6-F)Phe²⁰)hPYY(3-36)NH₂; (SEQ ID NO. 31)
[0259] ((2,3,4,5,6-F)Phe²¹)hPYY(3-36)NH₂; (SEQ ID NO. 32)
[0260] Ac-((2,3,4,5,6-F)Phe²⁶)hPYY(22-36)NH₂; (SEQ ID NO. 33)
[0261] Ac-((2,3,4,5,6-F)Phe²⁶)hPYY(24-36)NH₂; (SEQ ID NO. 34)

- [0262] ((2,3,4,5,6-F)Phe²⁶)hPYY(3-36)NH₂; (SEQ ID NO. 35)
- [0263] Ac-((2,3,4,5,6-F)Phe²⁷)hPYY(22-36)NH₂; (SEQ ID NO. 36)
- [0264] Ac-((2,3,4,5,6-F)Phe²⁷)hPYY(24-36)NH₂; (SEQ ID NO. 37)
- [0265] ((2,3,4,5,6-F)Phe²⁷)hPYY(3-36)NH₂; (SEQ ID NO. 38)
- [0266] Ac-((2,3,4,5,6-F)Phe³⁶)hPYY(22-36)NH₂; (SEQ ID NO. 39)
- [0267] Ac-((2,3,4,5,6-F)Phe³⁶)hPYY(24-36)NH₂; (SEQ ID NO. 40)
- [0268] ((2,3,4,5,6-F)Phe³⁶)hPYY(3-36)NH₂; (SEQ ID NO. 41)
- [0269] ((3,4,5-F)Phe²⁰)hPYY(3-36)NH₂; (SEQ ID NO. 42)
- [0270] ((3,4,5-F)Phe²¹)hPYY(3-36)NH₂; (SEQ ID NO. 43)
- [0271] Ac-((3,4,5-F)Phe²⁶)hPYY(22-36)NH₂; (SEQ ID NO. 44)
- [0272] Ac-((3,4,5-F)Phe²⁶)hPYY(24-36)NH₂; (SEQ ID NO. 45)
- [0273] ((3,4,5-F)Phe²⁶)hPYY(3-36)NH₂; (SEQ ID NO. 46)
- [0274] Ac-((3,4,5-F)Phe²⁷)hPYY(22-36)NH₂; (SEQ ID NO. 15)
- [0275] Ac-((3,4,5-F)Phe²⁷)hPYY(24-36)NH₂; (SEQ ID NO. 47)
- [0276] ((3,4,5-F)Phe²⁷)hPYY(3-36)NH₂; (SEQ ID NO. 12)
- [0277] Ac-((3,4,5-F)Phe³⁶)hPYY(22-36)NH₂; (SEQ ID NO. 48)
- [0278] Ac-((3,4,5-F)Phe³⁶)hPYY(24-36)NH₂; (SEQ ID NO. 49)
- [0279] ((3,4,5-F)Phe³⁶)hPYY(3-36)NH₂; (SEQ ID NO. 50)
- [0280] Ac-(D²Pal²⁶)hPYY(22-36)NH₂; (SEQ ID NO. 26)
- [0281] Ac-(2Pal²⁶)hPYY(22-36)NH₂; (SEQ ID NO. 27)
- [0282] Ac-(2Pal²⁶, Leu³¹)hPPY(24-36)NH₂; (SEQ ID NO. 18)
- [0283] Ac-(3Pal²⁶)hPYY(22-36)NH₂; (SEQ ID NO. 14)
- [0284] (3Pal²⁶)hPYY(3-36)NH₂; (SEQ ID NO. 5)
- [0285] Ac-(3Pal²⁶, Leu³¹)hPPY(24-36)NH₂; (SEQ ID NO. 16)
- [0286] Ac-(4Pal²⁶)hPYY(22-36)NH₂; (SEQ ID NO. 13)
- [0287] Ac-(4Pal²⁶, Leu³¹)hPPY(24-36)NH₂; (SEQ ID NO. 17)
- [0288] Ac-(A5c²²)hPYY(22-36)NH₂ (SEQ ID NO. 4)
- [0289] Ac-(A5c³¹)hPYY(22-36)NH₂; (SEQ ID NO. 24)

[0290]	Ac-(A5c ³¹)hPYY(24-36)NH ₂ ;	(SEQ ID NO. 51)
[0291]	(A5c ³¹)hPYY(3-36)NH ₂	(SEQ ID NO. 3)
[0292]	(A6c ¹⁰)hPYY(3-36)NH ₂ ;	(SEQ ID NO. 52)
[0293]	(A6c ¹¹)hPYY(3-36)NH ₂ ;	(SEQ ID NO. 53)
[0294]	(A6c ¹²)hPYY(3-36)NH ₂ ;	(SEQ ID NO. 54)
[0295]	(A6c ¹³)hPYY(3-36)NH ₂ ;	(SEQ ID NO. 55)
[0296]	(A6c ¹⁵)hPYY(3-36)NH ₂ ;	(SEQ ID NO. 56)
[0297]	(A6c ¹⁶)hPYY(3-36)NH ₂ ;	(SEQ ID NO. 57)
[0298]	(A6c ¹⁷)hPYY(3-36)NH ₂ ;	(SEQ ID NO. 58)
[0299]	(A6c ¹⁸)hPYY(3-36)NH ₂ ;	(SEQ ID NO. 59)
[0300]	(A6c ²⁰)hPYY(3-36)NH ₂ ;	(SEQ ID NO. 60)
[0301]	(A6c ²¹)hPYY(3-36)NH ₂ ;	(SEQ ID NO. 61)
[0302]	Ac-(A6c ²²)hPYY(22-36)NH ₂ ;	(SEQ ID NO. 62)
[0303]	(A6c ²²)hPYY(3-36)NH ₂ ;	(SEQ ID NO. 63)
[0304]	Ac-(A6c ²⁴)hPYY(22-36)NH ₂ ;	(SEQ ID NO. 25)
[0305]	Ac-(A6c ²⁴)hPYY(24-36)NH ₂ ;	(SEQ ID NO. 64)
[0306]	(A6c ²⁴)hPYY(3-36)NH ₂ ;	(SEQ ID NO. 10)
[0307]	Ac-(A6c ²⁴ , Leu ³¹)hPYY(24-36)NH ₂ ;	(SEQ ID NO. 28)
[0308]	Ac-(A6c ²⁷)hPYY(22-36)NH ₂ ;	(SEQ ID NO. 65)
[0309]	Ac-(A6c ²⁷)hPYY(24-36)NH ₂ ;	(SEQ ID NO. 66)
[0310]	(A6c ²⁷)hPYY(3-36)NH ₂ ;	(SEQ ID NO. 67)
[0311]	Ac-(A6c ²⁸)hPYY(22-36)NH ₂ ;	(SEQ ID NO. 23)
[0312]	Ac-(A6c ²⁸)hPYY(24-36)NH ₂ ;	(SEQ ID NO. 68)
[0313]	(A6c ²⁸)hPYY(3-36)NH ₂ ;	(SEQ ID NO. 8)
[0314]	Ac-(A6c ²⁸ , Leu ³¹)hPYY(24-36)NH ₂ ;	(SEQ ID NO. 29)
[0315]	Ac-(A6c ²⁹)hPYY(22-36)NH ₂ ;	(SEQ ID NO. 69)
[0316]	Ac-(A6c ²⁹)hPYY(24-36)NH ₂ ;	(SEQ ID NO. 70)
[0317]	(A6c ²⁹)hPYY(3-36)NH ₂ ;	(SEQ ID NO. 71)

[0318]	(A6c ³)hPYY(3-36)NH ₂ ;	(SEQ ID NO. 72)
[0319]	Ac-(A6c ³⁰)hPYY(22-36)NH ₂ ;	(SEQ ID NO. 22)
[0320]	Ac-(A6c ³⁰)hPYY(24-36)NH ₂ ;	(SEQ ID NO. 73)
[0321]	(A6c ³⁰)hPYY(3-36)NH ₂ ;	(SEQ ID NO. 9)
[0322]	Ac-(A6c ³¹)hPYY(22-36)NH ₂ ;	(SEQ ID NO. 21)
[0323]	Ac-(A6c ³¹)hPYY(24-36)NH ₂ ;	(SEQ ID NO. 30)
[0324]	(A6c ³¹)hPYY(3-36)NH ₂ ;	(SEQ ID NO. 74)
[0325]	Ac-(A6c ³²)hPYY(22-36)NH ₂ ;	(SEQ ID NO. 75)
[0326]	Ac-(A6c ³²)hPYY(24-36)NH ₂ ;	(SEQ ID NO. 76)
[0327]	(A6c ³²)hPYY(3-36)NH ₂ ;	(SEQ ID NO. 77)
[0328]	(A6c ⁶)hPYY(3-36)NH ₂ ;	(SEQ ID NO. 78)
[0329]	(A6c ⁷)hPYY(3-36)NH ₂ ;	(SEQ ID NO. 79)
[0330]	(A6c ⁹)hPYY(3-36)NH ₂ ;	(SEQ ID NO. 80)
[0331]	(Act ¹²)hPYY(3-36)NH ₂ ;	(SEQ ID NO. 81)
[0332]	(Act ¹³)hPYY(3-36)NH ₂ ;	(SEQ ID NO. 82)
[0333]	Ac-(Act ²³)hPYY(22-36)NH ₂ ;	(SEQ ID NO. 83)
[0334]	(Act ²³)hPYY(3-36)NH ₂ ;	(SEQ ID NO. 84)
[0335]	Ac-(Act ³²)hPYY(22-36)NH ₂ ;	(SEQ ID NO. 85)
[0336]	Ac-(Act ³²)hPYY(24-36)NH ₂ ;	(SEQ ID NO. 86)
[0337]	(Act ³²)hPYY(3-36)NH ₂ ;	(SEQ ID NO. 87)
[0338]	(Act ⁷)hPYY(3-36)NH ₂ ;	(SEQ ID NO. 88)
[0339]	Ac-(Aib ²²)hPYY(22-36)NH ₂ ;	(SEQ ID NO. 89)
[0340]	(Aib ²²)hPYY(3-36)NH ₂ ;	(SEQ ID NO. 11)
[0341]	(Apc ¹⁹)hPYY(3-36)NH ₂ ;	(SEQ ID NO. 90)
[0342]	Ac-(Apc ²⁵)hPYY(22-36)NH ₂ ;	(SEQ ID NO. 91)
[0343]	Ac-(Apc ²⁵)hPYY(24-36)NH ₂ ;	(SEQ ID NO. 92)
[0344]	(Apc ²⁵)hPYY(3-36)NH ₂ ;	(SEQ ID NO. 93)
[0345]	Ac-(Apc ²⁶)hPYY(22-36)NH ₂ ;	(SEQ ID NO. 94)

- [0346] Ac-(Apc²⁶)hPYY(24-36)NH₂; (SEQ ID NO. 95)
- [0347] (Apc²⁶)hPYY(3-36)NH₂; (SEQ ID NO. 96)
- [0348] Ac-(Apc³³)hPYY(22-36)NH₂; (SEQ ID NO. 97)
- [0349] Ac-(Apc³³)hPYY(24-36)NH₂; (SEQ ID NO. 98)
- [0350] (Apc³³)hPYY(3-36)NH₂; (SEQ ID NO. 99)
- [0351] Ac-(Apc³⁴)hPYY(22-36)NH₂; (SEQ ID NO. 100)
- [0352] Ac-(Apc³⁴)hPYY(24-36)NH₂; (SEQ ID NO. 101)
- [0353] (Apc³⁴)hPYY(3-36)NH₂; (SEQ ID NO. 102)
- [0354] Ac-(Apc³⁵)hPYY(22-36)NH₂; (SEQ ID NO. 103)
- [0355] Ac-(Apc³⁵)hPYY(24-36)NH₂; (SEQ ID NO. 104)
- [0356] (Apc³⁵)hPYY(3-36)NH₂; (SEQ ID NO. 7)
- [0357] Ac-(Apc³⁶)hPYY(22-36)NH₂; (SEQ ID NO. 105)
- [0358] Ac-(Apc³⁶)hPYY(24-36)NH₂; (SEQ ID NO. 106)
- [0359] (Apc³⁶)hPYY(3-36)NH₂; (SEQ ID NO. 107)
- [0360] (Apc⁴)hPYY(3-36)NH₂; (SEQ ID NO. 108)
- [0361] (Taz²⁶)hPYY(3-36)NH₂; (SEQ ID NO. 6)
- [0362] Ac-(Taz²⁶)hPYY(22-36)NH₂; or (SEQ ID NO. 20)
- [0363] Ac-(Taz²⁶, Leu³¹)hPPY(24-36)NH₂; (SEQ ID NO. 19)

[0364] or a pharmaceutically acceptable salt thereof.

[0365] In yet a still more preferred embodiment the present invention is concerned with a compound according to the immediately foregoing list of compounds, wherein said compound is:

- [0366] [A5C³¹]hPYY(3-36)NH₂ (SEQ ID NO. 3)
- [0367] Ac-[A5C²²]hPYY(22-36)NH₂ (SEQ ID NO. 4)
- [0368] [3Pal²⁶]hPYY(3-36)NH₂; (SEQ ID NO. 5)
- [0369] [Taz²⁶]hPYY(3-36)NH₂; (SEQ ID NO. 6)
- [0370] [Apc³⁵]hPYY(3-36)NH₂; (SEQ ID NO. 7)
- [0371] [A6C²⁶]hPYY(3-36)NH₂; (SEQ ID NO. 8)

- [0372] [A6C³⁰]hPYY(3-36)NH₂; (SEQ ID NO. 9)
- [0373] [A6C²⁴]hPYY(3-36)NH₂; (SEQ ID NO. 10)
- [0374] [Aib²²]hPYY(3-36)NH₂; (SEQ ID NO. 11)
- [0375] [((3,4,5-F)Phe)²⁷]hPYY(3-36)NH₂; (SEQ ID NO. 12)
- [0376] Ac-[4Pal²⁶]hPYY(22-36)NH₂; (SEQ ID NO. 13)
- [0377] Ac-[3Pal²⁶]hPYY(22-36)NH₂; (SEQ ID NO. 14)
- [0378] Ac-[((3,4,5-F)Phe)²⁷]hPYY(22-36)NH₂; (SEQ ID NO. 15)
- [0379] Ac-(3Pal²⁶, Leu³¹)hPPY(24-36)NH₂; (SEQ ID NO. 16)
- [0380] Ac-(4Pal²⁶, Leu³¹)hPPY(24-36)NH₂; (SEQ ID NO. 17)
- [0381] Ac-(2Pal²⁶, Leu³¹)hPPY(24-36)NH₂; (SEQ ID NO. 18)
- [0382] Ac-(Taz²⁶, Leu³¹)hPPY(24-36)NH₂; (SEQ ID NO. 19)
- [0383] Ac-[Taz²⁶]hPYY(22-36)NH₂; (SEQ ID NO. 20)
- [0384] Ac-[A6c³¹]hPYY(22-36)NH₂; (SEQ ID NO. 21)
- [0385] Ac-[A6c³⁰]hPYY(22-36)NH₂; (SEQ ID NO. 22)
- [0386] Ac-[A6c²⁸]hPYY(22-36)NH₂; (SEQ ID NO. 23)
- [0387] Ac-[A5c³¹]hPYY(22-36)NH₂; (SEQ ID NO. 24)
- [0388] Ac-[A6C²⁴]hPYY(22-36)NH₂; (SEQ ID NO. 25)
- [0389] Ac-[D2Pal²⁶]hPYY(22-36)NH₂; (SEQ ID NO. 26)
- [0390] Ac-[2Pal²⁶]hPYY(22-36)NH₂; (SEQ ID NO. 27)
- [0391] Ac-[A6C²⁴, Leu³¹]hPYY(24-36)NH₂; (SEQ ID NO. 28)
- [0392] Ac-[A6C²⁸, Leu³¹]hPYY(24-36)NH₂; or (SEQ ID NO. 29)
- [0393] Ac-[A6C³¹]hPYY(24-36)NH₂; (SEQ ID NO. 30)

[0394] or a pharmaceutically acceptable salt thereof.

[0395] In yet a still more preferred embodiment the present invention is concerned with a compound according to the immediately foregoing list of compounds, wherein said compound is:

- [0396] [A5C³¹]hPYY(3-36)NH₂ (SEQ ID NO. 3)
- [0397] [3Pal²⁶]hPYY(3-36)NH₂; (SEQ ID NO. 5)
- [0398] [Taz²⁶]hPYY(3-36)NH₂; (SEQ ID NO. 6)

- [0399] [A6C²⁸]hPYY(3-36)NH₂; (SEQ ID NO. 8)
- [0400] [A6C²⁴]hPYY(3-36)NH₂; (SEQ ID NO. 10)
- [0401] [Aib²²]hPYY(3-36)NH₂; (SEQ ID NO. 11)
- [0402] [((3,4,5-F)Phe)²⁷]hPYY(3-36)NH₂; (SEQ ID NO. 12)
- [0403] Ac-[4Pal²⁶]hPYY(22-36)NH₂; (SEQ ID NO. 13)
- [0404] Ac-[3Pal²⁶]hPYY(22-36)NH₂; (SEQ ID NO. 14)
- [0405] Ac-(3Pal²⁶, Leu³¹)hPPY(24-36)NH₂; or (SEQ ID NO. 16)
- [0406] Ac-(4Pal²⁶, Leu³¹)hPPY(24-36)NH₂; (SEQ ID NO. 17)
- [0407] or a pharmaceutically acceptable salt thereof.

[0408] In yet a still more preferred embodiment the present invention is concerned with a compound according to the immediately foregoing list of compounds, wherein said compound is:

- [0409] [A5C³¹]hPYY(3-36)NH₂ (SEQ ID NO. 3)
- [0410] [3Pal²⁶]hPYY(3-36)NH₂; (SEQ ID NO. 5)
- [0411] [Taz²⁶]hPYY(3-36)NH₂; (SEQ ID NO. 6)
- [0412] [Apc³⁵]hPYY(3-36)NH₂; (SEQ ID NO. 7)
- [0413] [A6C²⁸]hPYY(3-36)NH₂; (SEQ ID NO. 8)
- [0414] [A6C²⁴]hPYY(3-36)NH₂; (SEQ ID NO. 10)
- [0415] [Aib²²]hPYY(3-36)NH₂; (SEQ ID NO. 11)
- [0416] Ac-[4Pal²⁶]hPYY(22-36)NH₂; (SEQ ID NO. 13)
- [0417] Ac-[3Pal²⁶]hPYY(22-36)NH₂; (SEQ ID NO. 14)
- [0418] Ac-(3Pal²⁶, Leu³¹)hPPY(24-36)NH₂; (SEQ ID NO. 16)
- [0419] Ac-(4Pal²⁶, Leu³¹)hPPY(24-36)NH₂; or (SEQ ID NO. 17)
- [0420] or a pharmaceutically acceptable salt thereof.

[0421] In yet a still more preferred embodiment the present invention is concerned with a compound according to the immediately foregoing list of compounds, wherein said compound is:

- [0422] [A5C³¹]hPYY(3-36)NH₂ (SEQ ID NO. 3)
- [0423] [3Pal²⁶]hPYY(3-36)NH₂; (SEQ ID NO. 5)
- [0424] [A6C²⁸]hPYY(3-36)NH₂; (SEQ ID NO. 8)

[0425] [A6C²⁴]hPYY(3-36)NH₂; or (SEQ ID NO. 10)

[0426] Ac-[4Pal²⁶]hPYY(22-36)NH₂; (SEQ ID NO. 13)

[0427] or a pharmaceutically acceptable salt thereof.

[0428] In another aspect the present invention relates to a pharmaceutical composition comprising one or more compounds as defined in paragraphs [021] through [0428], or a pharmaceutically acceptable salt thereof, and a pharmaceutically acceptable carrier.

[0429] In another aspect the present invention relates to a method of decreasing excess intestinal water and electrolyte secretion in a mammal in need thereof, said method comprising administering to said mammal an effective amount of one or more compounds as defined in paragraphs [021] through [0428], or a pharmaceutically acceptable salt thereof.

[0430] In another aspect the present invention relates to a method of regulating the proliferation of a cell type in a mammal in need thereof, said method comprising administering to said mammal an effective amount of one or more compounds as defined in paragraphs [021] through [0428], or a pharmaceutically acceptable salt thereof.

[0431] In preferred embodiments of the immediately preceding method said cell type is gastrointestinal cells and/or epithelial cells.

[0432] In another aspect the present invention relates to a method of augmenting nutrient transport in a mammal in need thereof, said method comprising administering to said mammal an effective amount of one or more compounds as defined in paragraphs [021] through [0428], or a pharmaceutically acceptable salt thereof.

[0433] In another aspect the present invention relates to a method of regulating lipolysis in a mammal in need thereof, said method comprising administering to said mammal an effective amount of one or more compounds as defined in paragraphs [021] through [0428], or a pharmaceutically acceptable salt thereof.

[0434] In another aspect the present invention relates to a method of regulating blood flow in a mammal in need thereof, said method comprising administering to said mammal an effective amount of one or more compounds as defined in paragraphs [021] through [0428], or a pharmaceutically acceptable salt thereof.

[0435] In another aspect the present invention relates to a method of facilitating weight loss, appetite decrease, weight maintenance, treating obesity, treating diabetes, treating complications of diabetes including retinopathy; or treating cardiovascular disorders in a mammal in need thereof, said method comprising administering to said mammal an effective amount of one or more compounds as defined in paragraphs [021] through [0428], or a pharmaceutically acceptable salt thereof.

[0436] In a preferred embodiment of the immediately preceding method said excessive weight is a contributing factor to a disease or condition including hypertension, diabetes, dyslipidemia, cardiovascular disease, gall stones, osteoarthritis and cancers.

[0437] In a more preferred embodiment of the immediately preceding method said facilitation of weight loss reduces the likelihood of such diseases or conditions or where said facilitation of weight loss comprises at least part of a treatment for such diseases or conditions.

[0438] In another aspect the present invention relates to a method of antagonizing the effects of PYY(3-36) in a mammal in need thereof, said method comprising administering to said mammal an effective amount of one or more compounds as defined in paragraphs [021] through [0428], or a pharmaceutically acceptable salt thereof, wherein said compound is a PYY antagonist.

[0439] In a preferred embodiment of the immediately preceding method said antagonist effects in said mammal comprise facilitating weight gain, facilitating maintenance in weight, and/or facilitating appetite increase.

[0440] In more a preferred embodiment of the immediately preceding method said facilitating weight gain, facilitating maintenance in weight, and/or facilitating appetite increase is indicated in a mammal having a disease or disorder, or under going a treatment, accompanied by weight loss.

[0441] In a still more preferred embodiment of the immediately preceding method said diseases or disorders accompanied by weight loss include anorexia, bulimia, cancer cachexia, AIDS, wasting, cachexia, and wasting in frail elderly, or said treatment accompanied by weight loss comprises chemotherapy, radiation therapy, temporary or permanent immobilization, or dialysis.

[0442] In another aspect, this invention is directed to radiolabeled analogs of formula (I). Preferably the analogs have a tyrosine residue iodinated on the phenyl ring, preferably at carbon position 3 or 5. The radioactive iodine is preferably I^{125} or I^{123} . The chemistry associated with iodinated tyrosine residues within peptides is well known in the art of peptide chemistry. (See, e.g., European Patent Application 0389180, herein incorporated by reference.) Accordingly, radiolabeled PYY analogs can be used for assays in respect of PYY receptors, e.g., for competitive binding assays, for imaging cells containing PYY receptors, etc.

[0443] In another aspect, this invention is directed to a pharmaceutical composition comprising any one or more compounds as defined in paragraphs [021] through [0428], or a pharmaceutically acceptable salt thereof, and a pharmaceutically acceptable carrier.

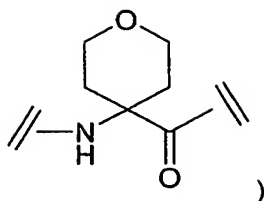
DETAILED DESCRIPTION

[0444] As set forth above and for convenience in describing this invention, the conventional and nonconventional abbreviations for the various amino acids are used. They are familiar to those skilled in the art, but for clarity are listed below. All peptide sequences mentioned herein are written according to the usual convention whereby the N-terminal amino acid is on the left and the C-terminal amino acid is on the right, unless noted otherwise.

[0445] Abbreviations (e.g. Ala) of amino acids in this disclosure stand for the structure -NH-C(R)(R')-CO- , wherein R and R' each is, independently, hydrogen or the side chain of an amino acid (e.g., $\text{R} = \text{CH}_3$ and $\text{R}' = \text{H}$ for Ala), or R and R' may be joined to form a ring system. The term "N-methylated variant" refers to the same structure wherein the hydrogen atom attached to the nitrogen atom is replaced by methyl; i.e., $\text{-N(CH}_3\text{)-C(R)(R')-CO-}$. For the N-terminal amino acid, the abbreviation stands for the structure =N-C(R)(R')-CO- , wherein "=" represents the bonds to R^2 and R^3 , defined herein.

[0446] A peptide of this invention is also denoted herein by another format, e.g., $(\text{A5C}^{31})\text{hPYY}(3\text{-}36)\text{NH}_2$, with the substituted amino acid(s) from the natural sequence, (here, hPYY, i.e., human PYY) placed between the first set of parentheses (e.g., A5c^{31} for Val^{31} in $\text{hPYY}(3\text{-}36)$). The numbers between the second set of parentheses refer to the number of amino acids present in the peptide. For example, "hPYY(22-36)" refers to amino acids 22 through 36 of the peptide sequence for human PYY. The designation " NH_2 " in, e.g., $(\text{A5C}^{31})\text{hPYY}(3\text{-}36)\text{NH}_2$, indicates that the C-terminus of the peptide is amidated. $(\text{A5C}^{31})\text{hPYY}(3\text{-}36)$ or $(\text{A5C}^{31})\text{hPYY}(3\text{-}36)\text{-OH}$, indicates that the C-terminus is the free acid.

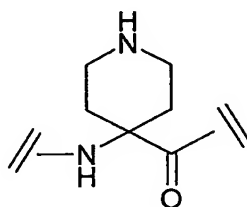
Abu	α -aminobutyric acid
Acc	1-amino-1-cyclo($\text{C}_3\text{-C}_9$)alkyl carboxylic acid
A3c	1-amino-1-cyclopropanecarboxylic acid
A4c	1-amino-1-cyclobutanecarboxylic acid
A5c	1-amino-1-cyclopentanecarboxylic acid
A6c	1-amino-1-cyclohexanecarboxylic acid
Act	4-amino-4-carboxytetrahydropyran



(i.e., the structure:

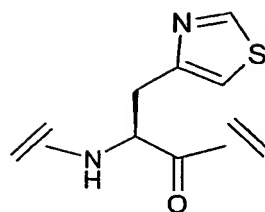
)

Aib	α -aminoisobutyric acid
Aic	2-aminoindan-2-carboxylic acid
Ala or A	alanine
β -Ala	beta-alanine



Apc	denotes the structure:
Arg or R	arginine
hArg	homoarginine
Asn or N	asparagine
Asp or D	aspartic acid
Cha	β -cyclohexylalanine
Cys or C	cysteine
Dab	2,4-diaminobutyric acid
Dap	2,3-diaminopropionic acid
Dhp	3,4-dehydroproline
Dmt	5,5-dimethylthiazolidine-4-carboxylic acid
2Fua	β -(2-furyl)-alanine
Gln or Q	glutamine
Glu or E	glutamic acid
Gly or G	glycine
His or H	histidine
3Hyp	trans-3-hydroxy-L-proline

	(i.e., (2S, 3S)-3-hydroxypyrrolidine-2-carboxylic acid)
4Hyp	4-hydroxyproline
	(i.e., (2S, 4R)-4-hydroxypyrrolidine-2-carboxylic acid)
Ile or I	isoleucine
Inc	indoline-2-carboxylic acid
Inp	isonipecotic acid
Ktp	4-ketoproline
Leu or L	leucine
hLeu	homoleucine
Lys or K	lysine
Met or M	methionine
1Nal	β -(1-naphthyl)alanine
2Nal	β -(2-naphthyl)alanine
Nle	norleucine
Nva	norvaline
Oic	octahydroindole-2-carboxylic acid
Orn	ornithine
2Pal	β -(2-pyridinyl)alanine
3Pal	β -(3-pyridinyl)alanine
4Pal	β -(4-pyridinyl)alanine
Phe or F	phenylalanine
hPhe	homophenylalanine
(3,4,5-F)Phe	3,4,5-trifluorophenylalanine
(2,3,4,5,6-F)Phe	2,3,4,5,6-pentafluorophenylalanine
Pip	pipecolic acid
Pro or P	proline
Ser or S	serine



Taz	β -(4-thiazolyl)alanine, i.e.,
2Thi	β -(2-thienyl)alanine
3Thi	β -(3-thienyl)alanine
Thr or T	threonine
Thz	thiazolidine-4-carboxylic acid
Tic	1,2,3,4-tetrahydroisoquinoline-3-carboxylic acid
Tle	tert-leucine
Trp or W	tryptophan
Tyr or Y	tyrosine
Val or V	valine

[0447] Certain other abbreviations used herein are defined as follows:

Ac:	acetyl
Boc:	<i>tert</i> -butoxycarbonyl
Bzl:	benzyl
DCM:	dichloromethane
DIC:	N, N-diisopropylcarbodiimide
DIEA:	diisopropylethyl amine
Dmab:	4-{N-(1-(4,4-dimethyl-2,6-dioxocyclohexylidene)-3-methylbutyl)-amino} benzyl
DMAP:	4-(dimethylamino)pyridine
DMF	N,N-dimethylformamide
DNP:	2,4-dinitrophenyl
Fmoc:	Fluorenylmethyloxycarbonyl
HBTU:	2-(1H-benzotriazole-1-yl)-1,1,3,3-tetramethyluronium hexafluorophosphate

cHex	cyclohexyl
HOAT:	O-(7-azabenzotriazol-1-yl)-1,1,3,3-tetramethyluronium hexafluorophosphate
HOBt:	1-hydroxy-benzotriazole
Mmt:	4-methoxytrityl
NMP:	N-methylpyrrolidone
Pbf:	2,2,4,6,7-pentamethyldihydrobenzofuran-5-sulfonyl
tBu:	tert-butyl
TIS:	triisopropylsilane
TOS:	tosyl
trt	trityl
TFA:	trifluoro acetic acid
TFFH:	tetramethylfluororaminidinium hexafluorophosphate
Z:	benzyloxycarbonyl

[0448] "Alkyl" refers to a hydrocarbon group containing one or more carbon atoms, where multiple carbon atoms if present are joined by single bonds. The alkyl hydrocarbon group may be straight-chain or contain one or more branches or cyclic groups.

[0449] "Substituted alkyl" refers to an alkyl wherein one or more hydrogen atoms of the hydrocarbon group are replaced with one or more substituents selected from the group consisting of halogen, (i.e., fluorine, chlorine, bromine, and iodine), -OH, -CN, -SH, -NH₂, -NHCH₃, -NO₂, -C₁₋₂ alkyl substituted with 1 to 6 halogens, (e.g., -CF₃, -C₂F₄, -C₂F₅, and the like), -OCH₃, -OCF₃, and -(CH₂)₀₋₄-COOH. In different embodiments 1, 2, 3 or 4 substituents are present. The presence of -(CH₂)₀₋₄-COOH results in the production of an alkyl acid. Non-limiting examples of alkyl acids containing, or consisting of, -(CH₂)₀₋₄-COOH, include 2-norbornane acetic acid, tert-butyric acid, 3-cyclopentyl propionic acid, and the like.

[0450] "Heteroalkyl" refers to an alkyl wherein one or more of the carbon atoms in the hydrocarbon group is/are replaced with one or more of the following groups: amino, amido, -O-, or carbonyl.

[0451] "Substituted heteroalkyl" refers to a heteroalkyl wherein one or more hydrogen atoms of the hydrocarbon group are replaced with one or more substituents selected from the group consisting of halogen, (i.e., fluorine, chlorine, bromine, and iodine), -OH, -CN, -SH, -NH₂, -NHCH₃, -NO₂, -C₁₋₂ alkyl substituted with 1 to 6 halogens, -CF₃, -OCH₃, -OCF₃, and

$-(CH_2)_{0-4}-COOH$. In different embodiments 1, 2, 3 or 4 substituents are present.

[0452] "Alkenyl" refers to a hydrocarbon group made up of two or more carbons where one or more carbon-carbon double bonds are present. The alkenyl hydrocarbon group may be straight-chain or contain one or more branches or cyclic groups.

[0453] "Substituted alkenyl" refers to an alkenyl wherein one or more hydrogens are replaced with one or more substituents selected from the group consisting of halogen (i.e., fluorine, chlorine, bromine, and iodine), $-OH$, $-CN$, $-SH$, $-NH_2$, $-NHCH_3$, $-NO_2$, $-C_{1-2}$ alkyl substituted with 1 to 6 halogens, $-CF_3$, $-OCH_3$, $-OCF_3$, and $-(CH_2)_{0-4}-COOH$. In different embodiments 1, 2, 3 or 4 substituents are present.

[0454] "Alkynyl" refers to a hydrocarbon group made up of two or more carbons where one or more carbon-carbon triple bonds are present. The alkynyl hydrocarbon group may be straight-chain or contain one or more branches or cyclic groups.

[0455] "Substituted alkynyl" refers to an alkynyl wherein one or more hydrogens are replaced with one or more substituents selected from the group consisting of halogen (i.e., fluorine, chlorine, bromine, and iodine), $-OH$, $-CN$, $-SH$, $-NH_2$, $-NHCH_3$, $-NO_2$, $-C_{1-2}$ alkyl substituted with 1 to 6 halogens, $-CF_3$, $-OCH_3$, $-OCF_3$, and $-(CH_2)_{0-4}-COOH$. In different embodiments 1, 2, 3 or 4 substituents are present.

[0456] "Aryl" refers to an optionally substituted aromatic group with at least one ring having a conjugated pi-electron system, containing up to two conjugated or fused ring systems. Aryl includes carbocyclic aryl, heterocyclic aryl and biaryl groups. Preferably, the aryl is a 5 or 6 membered ring. Preferred atoms for a heterocyclic aryl are one or more sulfur, oxygen, and/or nitrogen. Preferred examples of aryl include phenyl, 1-naphthyl, 2-naphthyl, indole, quinoline, 2-imidazole, and 9-anthracene. Aryl substituents are selected from the group consisting of $-C_{1-4}$ alkyl, $-C_{1-4}$ alkoxy, halogen (i.e., fluorine, chlorine, bromine, and iodine), $-OH$, $-CN$, $-SH$, $-NH_2$, $-NO_2$, $-C_{1-2}$ alkyl substituted with 1 to 5 halogens, $-CF_3$, $-OCF_3$, and $-(CH_2)_{0-4}-COOH$. In different embodiments the aryl contains 0, 1, 2, 3, or 4 substituents.

[0457] "Arylalkyl" refers to an "alkyl" joined to an "aryl".

[0458] "Acy" refers to $R-C(O)-$, where R is H, alkyl, substituted alkyl, heteroalkyl, substituted heteroalkyl, alkenyl, substituted alkenyl, alkynyl, substituted alkynyl, aryl, alkylaryl, substituted alkylaryl.

[0459] The compounds of the present invention can be provided in the form of pharmaceutically acceptable salts. Examples of preferred salts are those formed with pharmaceutically acceptable organic acids, e.g., acetic, lactic, maleic, citric, malic, ascorbic,

succinic, benzoic, salicylic, methanesulfonic, toluenesulfonic, trifluoroacetic, or pamoic acid, as well as polymeric acids such as tannic acid or carboxymethyl cellulose, and salts with inorganic acids, such as hydrohalic acids (e.g., hydrochloric acid), sulfuric acid, or phosphoric acid and the like. An example of a procedure for obtaining a pharmaceutically acceptable salt of a compound of this invention, more particularly the HCl salt, is as follows. A purified peptide is dissolved in 0.1% HCl-H₂O, loaded onto a semipreparative reverse phase column (250x10 mm, 10 μ M particle size, 300A pore size), and eluted with a gradient of 0-100% 0.1% HCl-CH₃CN in 0.1% HCl-H₂O. The fractions containing the peptide peak are combined, concentrated and lyophilized to obtain the HCl salt of the peptide.

[0460] A compound of the present invention can be made into compositions in the form of a liquid, pill, tablet, or capsule for oral administration; a liquid capable of being administered nasally as drops or spray or a liquid for intravenous, subcutaneous, parenteral, intraperitoneal or rectal administration. The therapeutic composition can also be in the form of an oil emulsion or dispersion in conjunction with a lipophilic salt such as pamoic acid, or in the form of a biodegradable sustained-release composition for subcutaneous or intramuscular administration.

[0461] The compounds of the invention exhibit a broad range of biological activities related to their antisecretory and antimotility properties. While not wishing to be bound to any particular theory regarding the mechanism of action, it is believed that the compounds suppress gastrointestinal secretions by direct interaction with epithelial cells and/or by inhibiting secretion of hormones or neurotransmitters which stimulate intestinal secretion. The compounds of the invention may also control intestinal blood flow which in turn may modulate intestinal hydrostatic pressure in favor of net water absorption.

[0462] The compounds of the invention are especially useful in the treatment of any number of gastrointestinal disorders that are associated with excess intestinal electrolytes and water secretion as well as decreased absorption, e.g., infectious (e.g., viral or bacterial) diarrhea, inflammatory diarrhea, short bowel syndrome, or the diarrhea which typically occurs following surgical procedure, e.g., ileostomy (see e.g. Harrison's principles of Internal Medicine, McGraw Hill Inc., New York, 12th ed.). Examples of infectious diarrhea include, without limitation, acute viral diarrhea, acute bacterial diarrhea (e.g., salmonella, campylobacter, and clostridium) or diarrhea due to protozoal infections, or travellers' diarrhea (e.g., Norwalk virus or rotavirus). Examples of inflammatory diarrhea include, without limitation, malabsorption syndrome, tropical spue, chronic pancreatitis, Crohn's disease, diarrhea, and irritable bowel syndrome. It has also been discovered that the peptides of the invention can be used to treat an emergency or life-threatening situation involving a gastrointestinal disorder, e.g., after surgery or due to cholera. Furthermore, the

compounds of the invention can be used to treat intestinal dysfunction in patients with Acquired Immune Deficiency Syndrome (AIDS), especially during cachexia.

[0463] The compounds of the invention are also useful for inhibiting small intestinal fluid and electrolyte secretion, and augmenting nutrient transport, as well as increasing cell proliferation in the gastrointestinal tract, regulating lipolysis in, e.g., adipose tissue and regulating blood flow in a mammal.

[0464] The compounds of the invention are advantageous because they are truncated versions of the natural PYY peptide; thus, the shorter peptide not only facilitates easier synthesis and purification of the compounds, but also improves and reduces manufacturing procedures and expenses. Moreover, a shorter PYY compound is advantageous because such peptides will interact solely with PYY receptors and not with homologous receptors such as NPY Y1, Y3 and Y5, thus minimizing unwanted agonist or antagonist side reactions.

[0465] The compounds of the invention can be and were produced using the techniques disclosed in the examples herein as well as techniques that are well known in the art. For example, a polypeptide region of a PYY analog can be chemically or biochemically synthesized and modified. Examples of techniques for biochemical synthesis involving the introduction of a nucleic acid into a cell and expression of nucleic acids are provided in Ausubel, *Current Protocols in Molecular Biology*, John Wiley, 1987-1998, and Sambrook *et al.*, in *Molecular Cloning, A Laboratory Manual*, 2nd Edition, Cold Spring Harbor Laboratory Press, 1989. Techniques for chemical synthesis of polypeptides are also well known in the art. (See e.g., Vincent in *Peptide and Protein Drug Delivery*, New York, N.Y., Dekker, 1990; For example, the peptides of this invention can be prepared by standard solid phase peptide synthesis. (See, e.g., Stewart, J.M., et al., *Solid Phase Synthesis*, 2nd Edition, Pierce Chemical Co., 1984.)

[0466] The substituents R² and R³ of the above generic formula may be attached to the free amine of the N-terminal amino acid by standard methods known in the art. For example, alkyl groups, e.g., (C₁-C₃₀)alkyl, may be attached using reductive alkylation. Hydroxyalkyl groups, e.g., (C₁-C₃₀)hydroxyalkyl, may also be attached using reductive alkylation wherein the free hydroxy group is protected with a t-butyl ester. Acyl groups, e.g., R"-C(O)-, may be attached by coupling the free acid, e.g., R"COOH, to the free amine of the N-terminal amino acid by mixing the completed resin with 3 molar equivalents of both the free acid and diisopropylcarbodiimide in methylene chloride for about one hour. If the free acid contains a free hydroxy group, e.g., p-hydroxyphenylpropionic acid, then the coupling should be performed with an additional 3 molar equivalents of HOBt.

[0467] Peptides can be and were synthesized on an Applied Biosystems model 433A peptide synthesizer (Foster City, CA) using Fluorenylmethyloxycarbonyl (Fmoc) chemistry. Rink Amide 4-methylbenzylhydramine (MBHA) resin is used to obtain peptide amides (e.g. Example 1 below). Wang resin is used to obtain peptide acids. Rink Amide resin (substitution = 0.72 mmol/g) or Wang resin (substitution = 0.5 mmol/g) is placed in the reaction vessel of the synthesizer. The amino acids (4 equivalents) are sequentially coupled to the resin with the coupling reagents of 2-(1-H-benzotriazole-1-yl)-1,1,2,3-tetramethyluronium hexafluorophosphate (HBTU) (3.8 equivalents), 1-hydroxy-benzotriazole (HOBT) (3.8 equivalents), and diisopropylethylamine (DIEA) (1 mL) in NMP.

[0468] When R^1 is $NH-X^6-CH_2-CONH_2$, (i.e., $Z^0=CONH_2$), the synthesis of the peptide starts with Fmoc-HN- X^6-CH_2-COOH which is coupled to the Rink Amide MBHA resin. If R^1 is $NH-X^6-CH_2-COOH$, (i.e., $Z^0=COOH$) the synthesis of the peptide starts with Fmoc-HN- X^6-CH_2-COOH which is coupled to Wang resin. For this particular step, 4 molar equivalents of Fmoc-HN- X^6-COOH , HBTU and HOBT and 10 molar equivalents of DIEA are used. The coupling time is about 2 hours.

[0469] At the end of peptide synthesis, the Fmoc- group is removed. In some cases the free alpha amino group is then acylated with a suitable acylating agent. For example, the acylation may be carried out using about 2 equivalents of acetic anhydride until the ninhydrin test is negative. (See example 2.)

[0470] The peptide-resin is then treated with a mixture of TFA, H_2O and triisopropylsilane (TIS) (V/V/V, 9.5/0.85/0.8) for about 4h. The resin is filtered off and the filtrate is poured into ether. The precipitate is collected by filtration and washed thoroughly with ether. This crude product is dissolved in a mixed solvent system of acetonitrile and aqueous acetic acid and purified on a reverse-phase preparative HPLC system. The fractions are checked by analytical HPLC and those containing pure product are pooled and lyophilized to dryness.

EXAMPLES

Example 1: $[A5C^{31}]hPYY(3-36)NH_2$ (SEQ ID NO. 3)

[0471] The titled protected peptide was synthesized on an Applied Biosystems model 433A peptide synthesizer (Foster City, CA) using Fluorenylmethyloxycarbonyl (Fmoc) chemistry. A Rink Amide 4-methylbenzylhydramine (MBHA) resin (Novabiochem., San Diego, CA) with substitution of 0.72 mmol/g was used. The Fmoc amino acids (AnaSpec, San Jose, CA) used were Fmoc-Tyr(tBu)-OH, Fmoc-Arg(Pbf)-OH, Fmoc-Gln(Trt)-OH, Fmoc-Thr(tBu)-OH, Fmoc-A5C-OH (Fmoc-1-aminocyclopentanecarboxylic acid), Fmoc-Leu-OH, Fmoc-Asn(Trt)-OH, Fmoc-His(Trt)-OH, Fmoc-Ser(tBu)-OH, Fmoc-Ala-OH, Fmoc-Glu(tBu)-OH, Fmoc-Pro-OH, Fmoc-Asp(tBu)-OH, Fmoc-Gly-OH, Fmoc-Lys(Boc)-OH, and Fmoc-Ile-

OH. The synthesis was carried out on a 0.25 mmol scale. The Fmoc groups were removed by treatment with 20% piperidine in N-methylpyrrolidone (NMP) for 30 min. In each coupling step, the Fmoc amino acid (4 eq, 1 mmol) was first pre-activated in 2 mL solution of 0.45M 2-(1-H-benzotriazole-1-yl)-1,1,2,3-tetramethyluronium hexafluorophosphate / 1-hydroxy-benzotriazole (HBTU/HOBT) in NMP. This activated amino acid ester, 1 mL of diisopropylethylamine (DIEA) and 1 mL of NMP were added to the resin. The ABI 433A peptide synthesizer was programmed to perform the following reaction cycle: (1) washing with NMP, (2) removing Fmoc protecting group with 20% piperidine in NMP for 30 min, (3) washing with NMP, (4) coupling with pre-activated Fmoc amino acid for 1h. The resin was coupled successively according to the sequence of the title peptide. After the peptide chain was assembled, the Fmoc group was removed and the resin was washed completely by using *N,N*-dimethylformamide (DMF) and dichloromethane (DCM).

[0472] At the end of the assembly of the peptide chain, the peptide-resin was transferred to a reaction vessel on a shaker and treated with a mixture of TFA, H₂O and triisopropylsilane (TIS) (9.5 mL / 0.85 mL / 0.8 mL) for 4h. The resin was filtered off and the filtrate was poured into 200 mL of ether. The precipitate was collected by filtration and washed thoroughly with ether. This crude product was dissolved in a mixture of acetonitrile and aqueous acetic acid solution and purified on a reverse-phase preparative HPLC system with a column (4 x 43 cm) of C₁₈ DYNAMAX-100 A⁰ (Varian, Walnut Creek, CA). The column was eluted over approximately 1 hour using a linear gradient of 95% A:5% B to 55% A:45% B, where A was 0.1% TFA in water and B was 0.1% TFA in acetonitrile. The fractions were checked by analytical HPLC and those containing pure product were pooled and lyophilized to dryness. Purity was assayed using HPLC and found to be approximately 97.6%. Electro-spray ionization mass spectrometry (ESI-MS) analysis gave the molecular weight at 4060.7 (in agreement with the calculated molecular weight of 4061.51).

Example 2: Ac-[A5C²²]hPYY(22-36)NH₂ (SEQ ID NO 4)

[0473] The titled peptide was synthesized and purified substantially according to the procedures described in Example 1. For the last coupling step, 2 mL of NMP solution containing 94 µL of Ac₂O, 44 µL of DIEA and 4 mg of HOBt was used to cap the N-terminal amino group with an acetyl functional group. The coupling time for this step was 30 min. Purity of the final acylated peptide was 99.9% based upon HPLC analysis. Electro-spray ionization mass spectrometry (ESI MS) analysis gave the molecular weight at 1970.9 (in agreement with the calculated molecular weight of 1971.29).

Examples 3 - 28

[0474] Examples 3 - 28 can be and were prepared substantially according to the procedures disclosed in Examples 1 and 2, above.

Ex.	Compound	SEQ ID NO.	Purity (HPLC)	Mol. Wt. (ESI-MS)	Mol. Wt. (Calculated)
3.	[3Pal ²⁶]hPYY(3-36)NH ₂	5	99.9	4060.0	4060.5
4.	[Taz ²⁶]hPYY(3-36)NH ₂	6	95.6	4066.2	4066.6
5.	[Apc ³⁵]hPYY(3-36)NH ₂	7	94.1	4019.0	4019.5
6.	[A6C ²⁸]hPYY(3-36)NH ₂	8	96.8	4062.0	4061.5
7.	[A6C ³⁰]hPYY(3-36)NH ₂	9	99.9	4062.0	4061.5
8.	[A6C ²⁴]hPYY(3-36)NH ₂	10	96.5	4062.0	4061.5
9.	[Aib ²²]hPYY(3-36)NH ₂	11	97.7	4064.0	4063.5
10.	[(3,4,5-F)Phe ²⁷]hPYY(3-36)NH ₂	12	99.9	4087.2	4087.5
11.	Ac-[4Pal ²⁶]hPYY(22-36)NH ₂	13	99.9	1942.0	1942.3
12.	Ac-[3Pal ²⁶]hPYY(22-36)NH ₂	14	99.0	1941.7	1942.3
13.	Ac-[(3,4,5-F)Phe ²⁷]hPYY(22-36)NH ₂	15	100	1969.2	1969.2
14.	Ac-(3Pal ²⁶ , Leu ³¹)hPPY(24-36)NH ₂	16	97.2	1797.7	1798.1
15.	Ac-(4Pal ²⁶ , Leu ³¹)hPPY(24-36)NH ₂	17	97.0	1797.7	1798.1
16.	Ac-(2Pal ²⁶ , Leu ³¹)hPPY(24-36)NH ₂	18	94.8	1797.9	1798.1
17.	Ac-(Taz ²⁶ , Leu ³¹)hPPY(24-36)NH ₂	19	97.9	1803.4	1804.2
18.	Ac-[Taz ²⁶]hPYY(22-36)NH ₂	20	97.9	1948.3	1948.3
19.	Ac-[A6c ³¹]hPYY(22-36)NH ₂	21	99.9	1957.2	1957.3
20.	Ac-[A6c ³⁰]hPYY(22-36)NH ₂	22	99.0	1942.9	1943.2
21.	Ac-[A6c ²⁸]hPYY(22-36)NH ₂	23	99.9	1942.8	1943.2
22.	Ac-[A5c ³¹]hPYY(22-36)NH ₂	24	99.9	1942.6	1943.2
23.	Ac-[A6C ²⁴]hPYY(22-36)NH ₂	25	99.9	1943.2	1943.2
24.	Ac-[D2Pal ²⁶]hPYY(22-36)NH ₂	26	96.0	1941.9	1942.3
25.	Ac-[2Pal ²⁶]hPYY(22-36)NH ₂	27	99.6	1941.8	1942.3
26.	Ac-[A6C ²⁴ , Leu ³¹]hPYY(24-36)NH ₂	28	97.5	1798.9	1799.1
27.	Ac-[A6C ²⁸ , Leu ³¹]hPYY(24-36)NH ₂	29	96.3	1798.9	1799.1
28.	Ac-[A6C ³¹]hPYY(24-36)NH ₂	30	98.8	1798.9	1799.1

Examples 29 - 56: Radioligand Binding Assay

[0475] Human neuroblastoma cell lines, SK-N-MC and SK-N-BE2 (American Type Culture Collection, Rockville, Md.) were cultured in EMEM media containing 10% fetal calf serum and 5% chicken embryo extract in a humidified atmosphere (37 °C) of 90% air and 10% CO₂.

[0476] For the in vitro Y1 and Y2 radioligand binding assays, the appropriate cells (SK-N-MC for Y1; SK-N-BE2 for Y2) were harvested, homogenized (Polytron, setting 6, 15 sec) in ice-cold 50 mM Tris-HCl (Buffer A), and centrifuged twice at 39,000 x g (10 min), with an intermediate resuspension in fresh buffer. The final pellets were resuspended in approximately 20 ml of 50 mM Tris-HCl containing 5.0 mM MgCl₂, 0.1 mg/ml bacitracin, and 0.1% BSA (Buffer B), and held on ice for the receptor binding assay.

[0477] For assay, aliquots (0.4 ml) of the foregoing suspensions were incubated with 0.05 ml of 0.05 nM [¹²⁵I-Leu³¹, Pro³⁴]PYY (Y1 receptor) or [¹²⁵I]PYY(3-36) (Y2 receptor), (each ~2200 Ci/mmol, New England Nuclear) in Buffer B, with or without 0.05 ml a solution (ranging from 0.01nM - 1000nM) of an unlabeled competing peptide. After a 120 min incubation (25 °C), the bound radioligand was separated from the free by rapid filtration through GF/C filters, previously soaked in 0.3% polyethyleneimine. The filters were then washed three times with 5-ml aliquots of ice-cold Buffer A. Specific binding was defined as the total PYY radioligand bound minus that bound in the presence of 1μM unlabeled PYY. Inhibition constants (K_i) were calculated using the well-known Cheng-Prusoff equation.

[0478] Each of the compounds of Examples 1 – 28 was subjected to the immediately foregoing radioligand assay and was found to have, for the Y2 receptor, a K_i of under 1000 nM, and for the Y1 receptor, a K_i of under 2000 nM. Nearly all of the compounds of Examples 1 – 18 had K_i values of under 30 nM for the Y2 receptor and under 300 nM for the Y1 receptor.

Antisecretory Effects; Intestinal Water and Sodium Absorption

[0479] The antisecretory effects and the effects on intestinal water and sodium absorption may be studied using techniques well known to one of skill in the art. For example, antisecretory effects may be investigated using the jejunal mucosa/short-circuit current (SCC) technique as described by Cox et al., J. Physiol. 398:65, 1988, ("Cox") and detailed in US Patent No. 6,046,167, ("U.S. '167") while intestinal water and sodium absorption may be investigated using the ileal Thiry-Vela fistulae technique, also detailed in U.S. '167. The contents of each of Cox and U.S. '167 are incorporated herein by reference in their entirety.

[0480] In the practice of the method of the present invention, an effective amount of any one of the peptides of this invention or a combination of any of the peptides of this invention or a pharmaceutically acceptable salt thereof, is administered via any of the usual and acceptable methods known in the art, either singly or in combination. The compounds or compositions can thus be administered orally (e.g., buccal cavity), sublingually, parenterally (e.g., intramuscularly, intravenously, or subcutaneously), rectally (e.g., by suppositories or washings), transdermally (e.g., skin electroporation) or by inhalation (e.g., by aerosol), and in

the form of either solid, liquid or gaseous dosage, including tablets and suspensions. The administration can be conducted in a single unit dosage form with continuous therapy or in a single dose therapy *ad libitum*.

[0481] Thus, the method of the present invention is practiced when relief of symptoms is specifically required or perhaps imminent. Alternatively, the method of the present invention is effectively practiced as continuous or prophylactic treatment.

[0482] Useful pharmaceutical carriers for the preparation of the compositions hereof, can be solids, liquids or gases; thus, the compositions can take the form of tablets, pills, capsules, suppositories, powders, enterically coated or other protected formulations (e.g. binding on ion-exchange resins or packaging in lipid-protein vesicles), sustained release formulations, solutions, suspensions, elixirs, aerosols, and the like. The carrier can be selected from the various oils including those of petroleum, animal, vegetable or synthetic origin, e.g., peanut oil, soybean oil, mineral oil, sesame oil, and the like. Water, saline, aqueous dextrose, and glycols are preferred liquid carriers, particularly (when isotonic with the blood) for injectable solutions. For example, formulations for intravenous administration comprise sterile aqueous solutions of the active ingredient(s) which are prepared by dissolving solid active ingredient(s) in water to produce an aqueous solution, and rendering the solution sterile. Suitable pharmaceutical excipients include starch, cellulose, talc, glucose, lactose, talc, gelatin, malt, rice, flour, chalk, silica, magnesium stearate, sodium stearate, glycerol monostearate, sodium chloride, dried skim milk, glycerol, propylene glycol, water, ethanol, and the like. The compositions may be subjected to conventional pharmaceutical additives such as preservatives, stabilizing agents, wetting or emulsifying agents, salts for adjusting osmotic pressure, buffers and the like. Suitable pharmaceutical carriers and their formulation are described in Remington's Pharmaceutical Sciences by E. W. Martin. Such compositions will, in any event, contain an effective amount of the active compound together with a suitable carrier so as to prepare the proper dosage form for proper administration to the recipient.

[0483] The dose of the compound of the present invention for treating the above-mentioned disorders varies depending upon the manner of administration, the age and the body weight of the subject, and the condition of the subject to be treated, and ultimately will be decided by the attending physician or veterinarian. Such an amount of the active compound as determined by the attending physician or veterinarian is referred to herein, and in the claims, as an "effective amount". Thus, a typical administration is oral administration or parenteral administration. The daily dose in the case of oral administration is typically in the range of 0.1 to 100 mg/kg body weight, and the daily dose in the case of parenteral administration is typically in the range of 0.001 to 50 mg/kg body weight.

[0484] While this invention has been particularly shown and described with references to preferred embodiments thereof, it will be understood by those skilled in the art that various changes in form and details may be made therein without departing from the spirit and scope of the invention as defined by the appended claims. Those skilled in the art will recognize or be able to ascertain using no more than routine experimentation, many equivalents to the specific embodiments of the invention described specifically herein. Such equivalents are intended to be encompassed in the scope of the claims. Also, all documents referred to herein are incorporated by reference into the present application as though fully set forth herein.

[0485] What is claimed is: